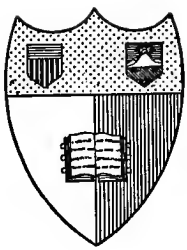
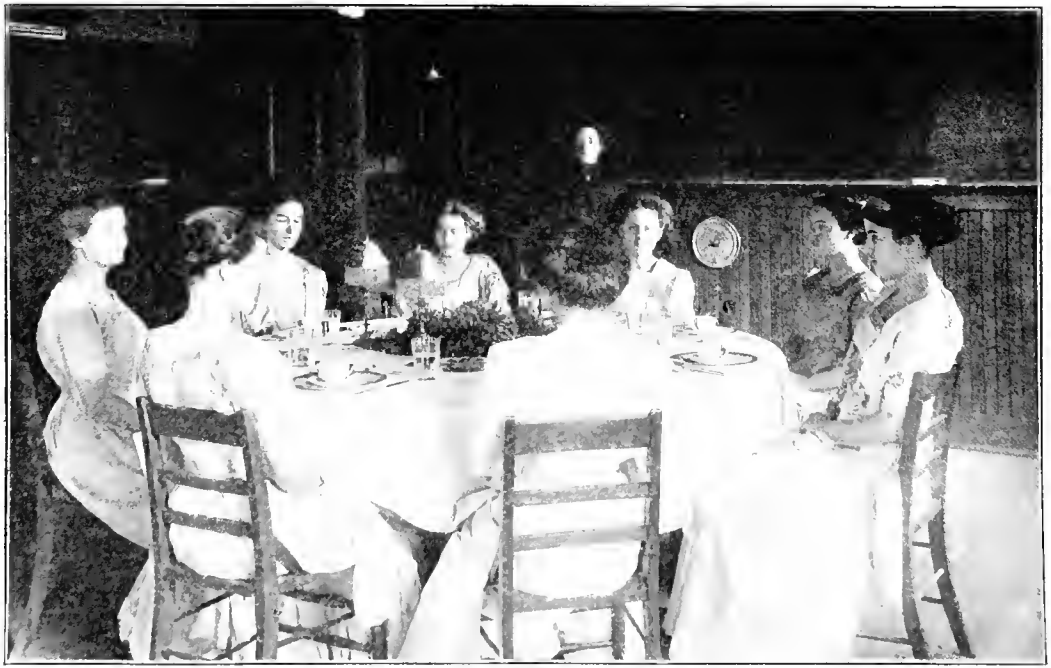
PRINCIPLES
OF
FOOD PREPARATION

MARY D. CHAMBERS

BOSTON COOKING SCHOOL
MAGAZINE CO.





A CLASS DINNER

PRINCIPLES

OF

FOOD PREPARATION

A MANUAL FOR STUDENTS OF
HOME ECONOMICS

BY

MARY D. CHAMBERS, B.S., A.M.

Formerly Instructor of Normal Classes in Domestic Science, Pratt Institute, Brooklyn, N. Y.; Professor of Domestic Economy and Head of the Department, The James Millikin University, Decatur, Illinois; Professor of Chemistry and Home Economics, and Head of the Departments, Rockford College, Rockford, Illinois

ILLUSTRATED

Second Edition

Revised and Enlarged

BOSTON

THE BOSTON COOKING-SCHOOL MAGAZINE CO.

1921

THE UNIVERSITY PRESS, CAMBRIDGE, U. S. A.

To the beloved students in various schools and colleges, who have endured the hardness of recitation, laboratory, and quiz with me, and who by their enthusiasm and interest have made our class periods hours of joy to the instructor, this book is lovingly dedicated

INTRODUCTION

THE following lessons have grown out of an experience of many years in teaching both high school and college classes. In the practical study of each food I have tried to give a sufficient variety of dishes to afford novelty and give scope for individual choice, as well as to make the work adaptable to students of varying degrees of ability or preparation. I have thrown as much as possible on the students themselves the responsibility of organizing the work in class, after the selection of recipes, experiments, etc., has been made by the teacher.[1]

The Exercises, involving original application of knowledge, usually form a lesson by themselves, where the students work quite independently.

Simple chemical tests and rough analyses of foods are included in most of the chapters, since in many of the smaller high schools and colleges this work is in charge of the teacher of Household Science.

The Topics for Study or Discussion — which include correlation with tributary subjects — and the Questions, are of course merely suggestive.

In the preparation of this book my thanks are due to Dr. Jessie Y. Cann, now of the Department of Chemistry in the University of Illinois, and to my former colleagues in the science departments of Rockford College, who have

[1] In no case is it supposed that all of the dishes given to illustrate the principles will be made during the class periods. A selection, including a sufficient variety for purposes of illustration, should be made by the teacher.

patiently answered my questions, and have given me references regarding newer theories and facts bearing on the chemical and physiological aspects of food. I am also indebted to my beloved former associate in the department of Home Economics, Miss Mildred Wood, who has conducted the laboratory experiments for me.

I am further indebted to the *Youth's Companion* for allowing me to use in modified form such parts of this text as first appeared in the *Companion* under the titles: "Batters and Doughs," "The Transformations of a White Sauce," and "The Evolution of an Oyster Stew." The *Boston Cooking-School Magazine* has done me the great favor of placing at my disposal many of the illustrations from its pages which now reappear in my text.

FOREWORD TO THE STUDENT OF HOME ECONOMICS

IN some schools the term Home Economics is applied to such studies as are designed to fit women to cope efficiently with the problems of the home. Inasmuch as the object of these courses is, or should be, to develop in the student a sense of values, the title Home Economics is one of the fittest that could be given. For to-day, more perhaps than at any other age of the world, it seems necessary for women to realize that the great, permanent values of life have always been controlled by them, have always been in their hands — can hardly be wrested from them unless they are willing to let them go.

The first of these great values is that factor so potent for either evil or good, *money*. Woman is the great money-spender of the world. Not only the weekly wage of the artisan, the income or earnings of the man in business or professional life, but even the wealth of the millionaire is either disposed of or appreciably controlled by the women of the families. It is not too much to say that of the aggregate earnings of men, the larger part is spent by women. Home Economics will help a woman to be a wise money-spender.

The second great value in the hands of woman is the provision of food. Ever since Eve gave Adam the apple, woman has been giving food to man, to his help or to his hurt. In the privacy of the family woman chooses and provides the materials for nutrition; in the greater num-

ber of public institutions the selection of the food is also in the hands of women. And stretching farther out, the woman in social service who has some knowledge of the science of dietetics, of the economics of nutrition, of sanitation and hygiene, is the woman who will hold and keep this great woman-function, that of the nourisher of the race. Home Economics will fit a woman to be a wise food-provider.

The third big thing in the hands of woman is the making of the home. This great social institution, on which all the others depend, is the creation of woman, and under present social conditions the organization of the household and the creation of that subtle atmosphere which makes the home the most important institution in the nation demand, for the best efficiency in this work, a fine and thorough training. Home Economics will help to fit a woman to be a home-maker.

The greatest of all the values in the hands of woman is the bearing, nurture, and training of the child. So essential, indeed, seems this function of motherhood to the nature of woman that few are found who do not in some fashion exercise it, either by the bearing, the nurture, the teaching, or the love of a child. Home Economics will help to fit a woman better to care for a child.

It is, then, to keep alive among the young women of to-day the old-fashioned ideals that have been proved true throughout the ages — while by no means excluding new ideals and opportunities — that this subject has now a place in the schools, either as a requirement or an elective.

This Manual deals chiefly with the second of the great values controlled by women, in that it treats of the modi-

fication of food — physically, chemically, and physiologically — by the processes of combination, cooking, and serving. Every one of the other values, however, is included to some extent in this subject. For one of the chief expenditures of money is for food; one of the chief features of the home is the social meal; one of the most important elements in the care of the child is its nutrition. It is perhaps hardly going too far to say that the right choice of food is basal to all physical, moral, and spiritual growth and usefulness.

PREFACE TO SECOND EDITION

SINCE this book first appeared the study of food has made great strides in advance, and its progress has been stimulated more by the discovery of vitamines than by any one other important discovery. The statement of Professor E. V. McCullum, in criticism of a dinner menu which included "steak, bread made without milk, butter, potatoes, peas, gravy, a flavored gelatine dessert and coffee," that such a meal, though appetizing and satisfying, would not promote health for very long in one of the animals he was experimenting on with regard to diet — this astonishing statement, and many others equally forcible, has wakened us all. We teachers now realize that if our students are taught nothing else, they must be taught right combinations of food, and how to choose the right foods to make a well-balanced diet. We realize that the chemical and physical standards of protein and calories have given place to the only logical standard, the biological one.

In the chapters added to this book, and in the Tables of the vitamine and other content of foods, we believe we have rounded out and completed this text so that it includes not only the principles of food preparation but the principles of correct nutrition, and in its revised and expanded form we offer it again to all our friends — teachers and students alike — who have shown their appreciation of the book by their use and generous commendation since it first appeared.

CONTENTS

APPENDICES

ILLUSTRATIONS

PRINCIPLES OF FOOD PREPARATION

CHAPTER I

THE EFFECT OF HEAT ON FOOD

To the Student. In the following Lessons the dishes to be cooked, as well as the more formal experiments to be made from time to time, have all been chosen to illustrate some principle essential to the correct preparation of food. The discovery of this principle is the most important thing in the whole lesson! All the rest is subordinate or tributary to this — for the Questions are planned to test your grasp of the principles the lesson was designed to teach, your ability to make from it a correct generalization, and your power to express clearly what you have learned; while the Exercises, wherever these are assigned, call upon you to show, not only that you have gained knowledge but that you can use it — since each exercise is a demand for the original application of a principle already learned.

Where several dishes are given in one lesson you may select from them those that you prefer to make — subject, of course, to the approval of your teacher. Ability to choose wisely is an excellent gift, and one that may be cultivated. For instance, in Lesson I you would naturally choose some one of the three animal foods, together with one vegetable and one fruit. In this lesson it would be a

good thing if you should form, with two other students, a group of three who might distribute the nine dishes among them and compare the results of one another's work, thus being able to make a more comprehensive inference — not to mention having a greater variety of dishes to enjoy in the miniature meal.

Remember that the cooking of each dish in perfection is always necessary in order to make the correct inference, which is the object of the lesson.

Meat Balls

Take an ounce and a half of finely chopped lean meat, season it lightly with salt and pepper, and form it into three meat balls of equal size. Allow one of these to remain uncooked, for the sake of comparison, or for what is known as a control test. Cook another by steaming it for ten minutes. Pan-boil the third — rolling it on a very hot pan until it is well browned on the outside. The pan should be so hot that the meat will not stick to it.

Compare the three meat balls: (1) as to size, weight, appearance, and consistency; (2) as to flavor.

Oysters, Steamed and Broiled

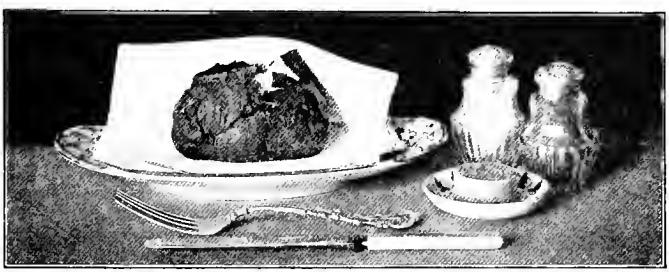
Select three oysters of about equal size, and weigh them in bulk. Allow one to remain uncooked, steam another until the gills separate and crinkle, broil the third over a clear fire or under a gas flame. Use a fine wire broiler, which should be lightly greased.

Compare the three oysters: (1) as to size, weight, and consistency; (2) as to flavor.

Eggs, Soft-cooked and Baked

Weigh three eggs. Cook one by placing it in a saucepan, pouring over it boiling water to cover, and then allowing it to stand near the heat, but not close enough to boil, for ten minutes. In the large end of the third egg prick several holes with a pin, being careful merely to penetrate the shell, then bake in a hot oven for 10 m.

Compare the three eggs: (1) as to weight and consistency; (2) as to flavor.



DAINTY SERVICE OF BAKED POTATO

Potatoes, Boiled and Baked

Scrub two potatoes with a small brush, and weigh them. Cook one by steaming or boiling for 30 m., cook the other by baking on the grate of a hot oven for 45 m.

Ascertain whether each one has lost or gained in weight as a result of cooking. Compare the flavor of the baked and the boiled potato. Compare both the flavor and the consistency of cooked and uncooked potatoes.

Beets, Baked and Steamed

Wash the beets, and trim off the ends to within about an inch of the roots, but avoid cutting or bruising the

skin, lest the color or sweetness of the vegetable be lost. Cook one of the beets in boiling water for from one-half to one hour for a young beet, for a much longer time if old. Bake the other on the grate of a hot oven for one hour, or until tender.

Compare the raw, steamed, and baked beets as to weight, color, and consistency.

After removing the skin the cooked beets should be sliced, quartered, and served hot with butter.

Tomatoes, Baked and Steamed

Wash two tomatoes, and weigh before cooking. Place one on a small dish in the steamer, and cook for 20–30 m. Place the other in a small agate pan, and bake in a hot oven for 10–15 m.

Compare raw, baked, and steamed tomatoes as to weight, color, flavor, and consistency.

Apples, Baked and Steamed

Wipe the apples, and core from the blossom end. Weigh before cooking. Steam and bake the same as tomatoes, allowing perhaps 5–10 m. longer for each cooking process.

Ascertain the loss or gain in weight after cooking. Compare the flavor and consistency of raw, baked, and steamed apples.

Peaches, Baked and Steamed

Weigh the peaches before cooking, and steam and bake the same as tomatoes, allowing 5–10 m. less for each process.

Compare raw, baked, and steamed peaches as to weight, flavor, and consistency.

Bananas, Baked and Steamed

Remove the skin from bananas and weigh them. Steam and bake the same as tomatoes, allowing 20 m. for the first process, 15 m. for the second.

Compare raw, baked, and steamed bananas as to weight, flavor, and consistency.

NOTE. The cooked fruit may be served with sugar and cream. A little lemon juice added to the bananas will be an improvement.

Experiment to Aid or Corroborate Inference

In order fully to prove or demonstrate one of the very important effects of heat on food, three petri dishes of sterilized nutrient jelly, such as is used in bacteriological studies, may be used if convenient. The jelly in one dish should be touched with the exposed surface of at least three of the uncooked foods — preferably one from each class—animal foods, fruits, vegetables. The jelly in a second dish should be touched with the freshly cut surface of each of the foods previously used. To the jelly in the third dish a bit of the same foods, freshly cooked, should be applied.

The dishes must be covered immediately, labeled, and allowed to stand for a few days before they are examined.

TOPICS FOR STUDY OR DISCUSSION

1. The approximate temperature of the cooking processes used in this lesson.
2. Other methods of applying heat to food, their advantages, etc.
3. Fuels used in cooking, their comparative cost, cleanliness, and ease of regulation or control.
4. Definition of Food.
5. Classification of foods into Protein, Fats, Carbo-

hydrates, Water, Minerals. Function, broadly speaking, of each in the diet.

QUESTIONS

1. Name the general effects of heat on food which are common in the case of both animal and vegetable foods.
2. What are the effects of heat which are opposite in the two cases?
3. How does the effect of dry heat differ from that of moist?
4. How does the effect of high temperature differ from that of low?
5. Why do potatoes take longer to bake than to boil, though the temperature of the oven is higher than that of boiling water?
6. How is it that you can hold your hand in a hot oven for a few seconds, without being burned, and you cannot hold it in boiling water?
7. In the case of the meat balls, what physical changes were brought about by pan-broiling that were not produced by steaming?
8. Name the protein foods in today's lesson, the carbohydrates. What fats were present?
9. Discuss how a meal, planned on the basis of three of the foods used in class today, could be cooked with the greatest economy of time and labor, consistent with the development of the most delicious flavor. What would be the cost of such a meal for four persons? (See charts, Appendix A.)

References

Bailey. Sanitary and Applied Chemistry, Chap. II.
Jordan. The Principles of Human Nutrition, Chap. XVI.
Hutchison. Food and Dietetics, Chap. XXII.
Snyder. Human Foods, Chap. II.
White. The Fuels of the Household.
Encyclopædia articles on fuels, etc.
Lassar-Cohn, Lecture IV, section on Meat and Soup.

CHAPTER II

EFFECT OF SALT ON CELLULOSE

STUDY OF POTATO, A TYPICAL STARCHY VEGETABLE

To the Student. The work in this and in most of the succeeding chapters will probably occupy at least two lesson periods. The Corroborative Experiment outlined at the close of the practical work in cooking potatoes will throw light on much that you will observe in making the various dishes. These experiments can be omitted where the results are evident from the work done, but when not actually performed they may be profitably read over or studied.

In this chapter the Exercises are introduced for the first time. These are not intended for the beginner in the formal study of cookery, but will be assigned by your instructor according as your proficiency warrants. They are designed to develop initiative and originality, or to give additional practice, or to afford opportunity to make further application of the principles learned from the work of each chapter.

EFFECT OF SALT ON CELLULOSE

Sweet Corn, Boiled

Divide an ear of corn into two parts. Cook one part in strongly salted boiling water for 20 m., cook the second

part in soft, unsalted water for 20 m. If very soft water is not at hand the second part may be steamed.

Compare the color and consistency of the two portions.

Potatoes

Scrub and pare a potato, and divide it into two parts. Cook one part in strongly salted boiling water for 30 m.; cook the other part in soft, unsalted water for 30 m.

Compare the color and consistency of the two portions. Is the effect of the salt as marked as in the case of the corn? Why? Is the cellulose of the potato as tough as that of the corn?

STUDY OF POTATO, A TYPICAL STARCHY VEGETABLE

Mashed Potatoes

Take two potatoes; pare one before cooking, cook the other in its jacket. Boil both for 30 m. Mash each one separately, using a fork to bruise the potato until it is free from lumps, then adding the right proportion of seasoning. This can be estimated from Ingredients for One Pint of Mashed Potatoes (see below). The mixture should then be beaten with a fork or a Dover beater until it is light and white.

Compare the behavior of the two potatoes during the making of this dish. Do you notice any difference in color, flavor, or consistency?

NOTE. In preparing mashed potatoes all the utensils used should be hot, the milk or cream added should also be hot, and the work should be performed as expeditiously as possible, since the flavor depends on the retention of the heat — the dish, if reheated, loses its delicacy.

Ingredients for One Pint of Mashed Potatoes.

3 or 4 medium-sized potatoes.
2 tablespoonfuls butter.
½ teaspoonful salt.
⅛ teaspoonful pepper.
Milk or cream sufficient to moisten, generally 1 cupful.

Potatoes with Cheese

This and the next dish are better illustrations of the principle involved when they are made in the full quantity given in the recipe. One or two students may be allowed to make the dishes for the whole class, but every student should have opportunity to compare the two.

Ingredients. Four medium-sized potatoes, freshly boiled, and pared before boiling. Two cups of grated cheese, two cups of medium white sauce (see recipe).

Method. Break the potatoes with a fork into good-sized pieces, and arrange these in a layer to cover the bottom of a baking-dish. Add a layer of grated cheese, then cover with white sauce, and proceed in this way until all the ingredients have been used. Cover with buttered crumbs (see recipe), and bake until brown on top.

Medium White Sauce

Ingredients.

4 tablespoonfuls butter.
4 tablespoonfuls flour.
½ teaspoonful salt.
⅛ teaspoonful pepper.
2 cups milk.

Method. Put flour, salt, pepper, and butter into a saucepan, and melt the butter over gentle heat until it is soft enough to blend with the flour. The butter should not be heated more than enough to soften it. (See Chapter XIII, page 122.) Add the milk, which may or may not have been previously scalded, about one-third at a time, and let the whole boil for about a minute.

Buttered Crumbs

Dry out pieces of stale bread in a very slow oven until they are crisp and brittle. Crush them with a rolling pin

on a molding board, and sift through a flour sifter. Measure the amount needed, and mix with one-fourth the volume of melted butter. A half-cupful of crumbs should be enough for one baking-dish of potatoes and cheese.

NOTE. Dry, sifted crumbs will keep indefinitely in a glass jar. This is a good way to utilize pieces of stale bread.

Baked Potatoes with Cheese

Proceed as for Potatoes with Cheese, but use freshly baked potatoes instead of boiled.

Compare the two dishes, noting especially: (1) the consistency of the cheese; (2) the flavor of the dish as a whole.

Baked Potatoes, Pared and Unpared

Choose two potatoes of similar size. Pare one, leave the other unpared, and bake both on the grate of a hot oven until soft.

Compare the two. Which potato was cooked the first?

Experiments designed to Aid or Corroborate Inferences

I

Analysis of Potato

1. Cut a thin cross-section from a raw potato, and hold it to the light to observe its structure. Make a diagram of what you see.

2. Pare the remainder of the potato, and grate it through cheesecloth into a bowl or beaker. Squeeze out the liquid, and examine the residue in the cloth.

3. Decant or filter the liquid. Examine the precipitate. Test this with iodine. Add to the precipitate four or five times its volume of water and boil the mixture.

What was the precipitate? What are its characteristic properties?

4. Filter the liquid from 3 through finely pulverized bone black. (Why?) Add to the clear filtrate one drop of a solution of platinic chloride. In the presence of potassium salts a yellow precipitate will be formed.

5. Apply a piece of red litmus paper to the residue from 2, to the liquid from 4.

6. Wash the residue from 2 as thoroughly as possible by allowing water to run through it on the cheesecloth. What is this substance? Try it on the effect of water, heat, and acid. What are its characteristic properties?

II

The Effect of Potassium Salts on Cheese

1. Melt a small portion of grated cheese, and divide it into two parts, A and B. Add to A a pinch of potassium chloride. Let it stand for a little while, and compare it with B. Relate your inference to the difference observed in the cheese dishes made today.

STUDY OF RICE IN COOKING

Boiled Rice

Wash the rice until when it is rubbed between the hands in clear water no further cloudiness appears. Cook it in abundance of violently boiling water — six quarts to one cup of rice will not be too much. Sprinkle in the rice a little at a time, and cook it for 15–20 m., or longer, according to the age of the rice. Old rice takes a longer time to soften. The boiling should be so violent as to keep the rice agitated and the grains well separated from one another.

Test it by pressing a grain between thumb and finger, and when it is found to be soft all through drain the rice through a colander, and set it in a hot oven for a moment to dry it a little. While in the oven the rice may be lightly lifted or tossed with a fork, to let the steam escape.

Rice cooked in this way may be served as a vegetable, or with cream and cooked fruit as a breakfast cereal.

Steamed Rice

Wash the rice as before, and stir it into boiling salted water, one cup of rice to one quart of water. Let it boil for 5 m., stirring gently with a fork to keep the rice lifted from the bottom, then cover and cook in a double boiler until the rice is soft.

Compare the boiled and the steamed rice.

Baked Rice

A thin layer of rice should be spread on a pie plate or a shallow pan, and baked in a moderate oven until it is lightly and evenly browned. The rice kernels should be shaken or stirred so that the grains may be a uniform color. The rice is then cooked as in Steamed Rice, but only half the amount of water, or a pint of water to one cup of rice, need be used.

Compare the steamed rice with the rice cooked according to this method.

Fig Marmalade to Serve with Rice

Press steamed figs through a colander, moisten slightly with water, and add sugar or lemon juice if desired.

TOPICS FOR STUDY OR DISCUSSION

1. Tubers, their nature and structure. Tubers other than potatoes which are used as food.
2. Loss of salts and other substances in cooking potatoes.
3. Theories regarding the structure of starch. Diagrams of the starch granules of rice and potato.
4. Protein sparers.
5. Cellulose, its function in the body.
6. The solanaceæ and solanin.
7. The growth and manufacture of rice; unpolished rice.

QUESTIONS

1. Name and describe the different substances isolated in your analysis of potato.
2. Compare the cross-section of the potato to the cross-section of a branch.
3. Under what conditions might it be better to cook potatoes in their jackets? Why? When might it be better to pare potatoes before cooking? Why?
4. Account for the fact that the pared potato took longer to bake than the unpared.
5. Could the water in which potatoes have been boiled be used for stock? For any household purpose? Explain.
6. If two average-sized potatoes, boiled after paring, lose, as is estimated, 17 per cent of their mineral matter, how many grams (of minerals) will remain? Potatoes contain about 1 per cent of salts. See Note, page 14.
7. Trace the connection between the experiments and the practical work in cooking potatoes.
8. Why must rice be thoroughly washed if the grains are to be kept distinct in cooking?
9. Why was less water needed in the process of steaming the baked rice?
10. Can you frame two general rules for the cooking of starchy vegetables?
11. What foods should be combined with these vegetables to make an appetizing and well-balanced meal?

12. Formulate the principles of food preparation gained from the work of this and the preceding chapter.

EXERCISES

1. Make a dish to show what should be combined with potatoes to supply their deficiencies.

2. Select at least two vegetables other than those used in class, and devise some method of cooking them in an acceptable and appetizing form, which yet shall illustrate the effect of salt on cellulose.

3. Show how the water in which rice was boiled may be made use of for any household purpose with economy and profit. Do the same with the water used in boiling potatoes; (*a*) in their jackets; (*b*) after paring.

References

Bailey. Sanitary and Applied Chemistry, Chap. XI.
Hutchison. Food and Dietetics, Chaps. XII, XIII, and XXII.
Jordan. The Principles of Human Nutrition, Chap. XVI.
Lassar-Cohn. Chemistry in Daily Life, Lect. IV, last paragraph.
Sherman. Chemistry of Food and Nutrition, see Index.
Thompson. Practical Dietetics, see Index, and Plates V and VI, opposite pp. 155 and 158.
Wiley. Foods and Food Adulterants, Parts V and VI.

Note to Question 6, page 13. The salts in potato are largely potassium compounds, and of these it has been estimated that 90 per cent are lost when the potato is pared before boiling.

CHAPTER III

STUDY OF GREEN VEGETABLES IN COOKING

To the Student. You have already learned that one of the effects of heat on food is the development of flavor. Whether in all cases the food is more appetizing when the flavor is developed to the utmost, is very largely a matter of individual preference. The work in the lesson that follows is planned rather to show how the flavor of certain vegetables may be either modified or developed, than to prescribe specific rules for the cooking of any of the vegetables you will deal with.

To Boil Cabbage

Place the cabbage head down in a large pan of cold, salted water for some hours before cooking. This will freshen the cabbage in winter; in summer it will serve to remove worms.

Cut the cabbage into quarters; remove the core and the outside leaves if these are wilted. Separate the sections into leaves, cut away the larger and harder midribs, and wash thoroughly.

Divide the portion of cabbage given you into two parts. Cook one in salted water, the other in water to which baking soda has been added in the proportion of one teaspoonful to a quart of water. The water in each case must be rapidly boiling, and generous in quantity. Allow

the cabbage to boil for 20–25 m. It may then be drained, seasoned, and served.

Compare the flavor resulting from the two methods. Do you observe a difference in consistency?

Escalloped Cabbage with Tomato

Arrange alternate layers of cooked and well-seasoned cabbage and tomato sauce (see recipe) in a baking dish. Cover with buttered crumbs (see page 9), and bake until crumbs are brown.

Tomato Sauce

Ingredients.

1 to 4 tablespoonfuls butter.
4 tablespoonfuls flour
½ teaspoonful salt.
⅛ teaspoonful pepper.
2 cups sifted tomato pulp.

Method. Proceed as for Medium White Sauce, page 9.

NOTE. Sifted tomato pulp is the pulp of tomatoes, either canned or fresh, which has been freed from skin and seeds by pressing through a colander with a wooden pestle, or the old-fashioned wooden potato masher. Care should be taken that none of the soft pulp is rejected, only the skin and seeds.

Escalloped Cabbage with Cheese

Proceed as for Escalloped Cabbage with Tomato, using grated cheese instead of tomato sauce for the alternate layers.

Compare the cabbage in the two dishes. Which had the tenderer fiber?

Buttered Onions

Peel small onions under water (to avoid any effect on the eyes), cook one or two in a small quantity of boiling

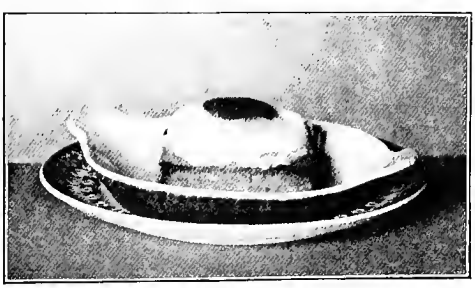
water until tender, cook the rest in a large amount of water, and change the water twice during the cooking process. When done, coat the onions with melted butter, roll in fine crumbs, place on serving dish, and set in the oven for a moment to brown the crumbs.

Compare the degree of flavor that resulted from the two methods of cooking.

Mashed Turnips

Wash and pare two turnips. Cut one into thin slices, cut the other into quarters. Boil both until tender. Drain and mash each one separately, season with salt and pepper, and serve very hot.

Compare the flavor resulting from the two methods.



SPINACH IN CROUSTADE

Spinach in Croustades

Wash the spinach leaf by leaf in abundance of water, removing thoroughly every trace of grit. Cook it, closely covered, in the water that clings to the leaves, turning it over once in a while to prevent its burning. During the latter part of the cooking process the lid may be removed, to encourage evaporation, and the spinach

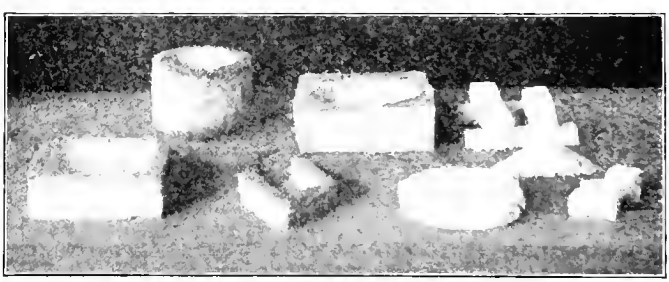
cooked down until the water is practically absorbed. Chop, season with salt and pepper, and serve in croustades, mixed with chopped, hard-boiled egg, and garnished with slices of the white and a little sifted yolk.

Cook another portion of spinach in a generous quantity of water, softened with baking soda, as in Boiled Cabbage.

Compare the flavor of the spinach cooked in both ways.

To Make Croustades. Remove the crust from a stale, brick-shaped loaf, and cut the crumb into eight cubes. (In making the dish for a family the crust may be removed and the loaf used entire.)

Dip five sides of each cube into melted butter, and brown delicately on a hot pan. Remove the crumb, leaving a box-shaped receptacle to be filled with the spinach and then garnished.



BREAD CROUSTADES, CROUTONS, ETC.

Creamed Carrots

Wash and scrape the carrots, and cut them into small cubes. Cook until tender in a small quantity of water. Drain, mix the water in which the carrots were cooked with a little milk or cream, and use this liquid to make a

sauce in which the carrot cubes are to be served. Follow method for making Medium White Sauce, page 9.

Another portion of the cooked carrot cubes may be served in a sauce made of milk alone.

Compare the flavor of the two dishes.

Boiled Squash

A young summer squash needs merely to be washed, pared, and cut into small pieces. Winter squash, if the shell is soft enough, must be peeled, and the seeds must be removed. Divide your portion of the vegetable into two parts, cook one part in boiling salted water, the other in unsalted water, until tender. Drain, mash, squeeze out the excess of water, and season with butter, salt, and pepper.

Compare the flavor of the squash boiled in salted with that boiled in unsalted water.

Boiled Parsnips

Take two parsnips, wash one of them, and cook it whole in boiling water until tender, when the peel can be easily removed. Scrape or pare the other, cut it into thin slices, and cook until tender in boiling water. Serve with butter. Compare the flavor of the two parsnips.

Experiments to Aid or Confirm Inferences

I

Effect of Certain Salts on the Solvent Properties of Water

1. Take three small beakers — A, B, and C. Half fill A with a solution of bicarbonate of soda, in the proportion

of one-half teaspoon of soda to one pint of water. Half fill B with a solution of common salt, in the proportion of one tablespoonful of salt to one pint of water. Use C for a control test. To each beaker add a pinch ($\frac{1}{16}$ teaspoon) of ground coffee, sprinkling it lightly on the water. Note results carefully as to taste and color of solution.

2. Repeat, using in each case a pinch of finely chopped parsley.

3. Repeat, using scraped onion or turnip. If definite results are not observed in the cold the solutions may be heated.

II

The Effect of Acid on Cellulose

1. Take two portions, A and B, of cotton wool, filter paper, or fiber from some fresh vegetable. Treat A with ordinary water, B with vinegar or acetic acid. Heat if necessary. Note results carefully.

TOPICS FOR STUDY OR DISCUSSION

1. The function of green vegetables in the diet.
2. Foods which promote energy directly, by combustion in the body, *e. g.*, the organic compounds of carbon. Foods which promote energy indirectly, *e. g.*, those whose salts affect osmotic pressure, or promote alkalinity of the blood, or stimulate by chemical or mechanical means the vegetative functions of the body.
3. The value of organic *vs.* inorganic salts in the diet.
4. Plants as the source of the world's food supply.
5. The brassica, or brassicaceæ family. The characteristic of this group which is of most importance to the student of foodstuffs.
6. Varieties of cabbage: the popular distinction between kale and cabbage. Digestibility of raw cabbage as compared with that of cooked cabbage.

QUESTIONS

1. Classify the vegetables used in the class work as: (1) Sweet-juiced, or possessing agreeable flavor, which the object in cooking should be to enhance or preserve; and (2) strong-juiced, or having a coarser flavor, which the object of cooking should be to modify or lessen. Make this classification according to your own preferences regarding the flavor of the vegetables.

2. State three methods of cooking strong-juiced vegetables, and name as many vegetables as you can which may be cooked with most advantage by each of the three methods.

3. State some methods of cooking sweet-juiced vegetables, and name as many vegetables as you can which may best be cooked by each method.

4. Name six vegetables with which you are familiar, preferably others than those which you have studied in class, and give, in tabular form, their characteristics, the object in cooking them, and how this object is attained. Consult instructor before framing your table.

5. Have you discovered any new principles of food preparation in your work with green vegetables? State such principles. Cite as many instances as you can of the application of these principles in the preparation of food.

6. Trace the relation of the experiments to the practical work in the cooking of the vegetables you have just dealt with.

7. Classify all the foods you have dealt with from the first lesson in this course into: (*a*) nutritious; (*b*) healthful, and (*c*) those which are both nutritious and healthful. (See charts, pages 217-34, for the protein content and calorific value of the foods used.)

8. Define the terms wholesome, cheap, economical as applied to foods. Which food used in class do you consider wholesomest? cheapest? most economical?

EXERCISES

1. Cook a red cabbage in water softened by baking soda. Devise some means of restoring the color.

2. What two other methods of cooking sweet-juiced vegetables, fitted to retain or develop their flavor, could be made use of? Demonstrate their expediency by employing these methods in cooking two vegetables.

3. Make a purée of any vegetable in season, using two methods, one to develop the flavor of the vegetable, the other to reduce it.

4. Devise two methods of making creamed celery, one which shall utilize every particle of the flavor of the celery, another which shall reduce the flavor as much as possible.

5. Cook cauliflower in two ways, one with the object of developing, the other of reducing its flavor. From your results decide whether you consider cauliflower a sweet-juiced or a strong-juiced vegetable.

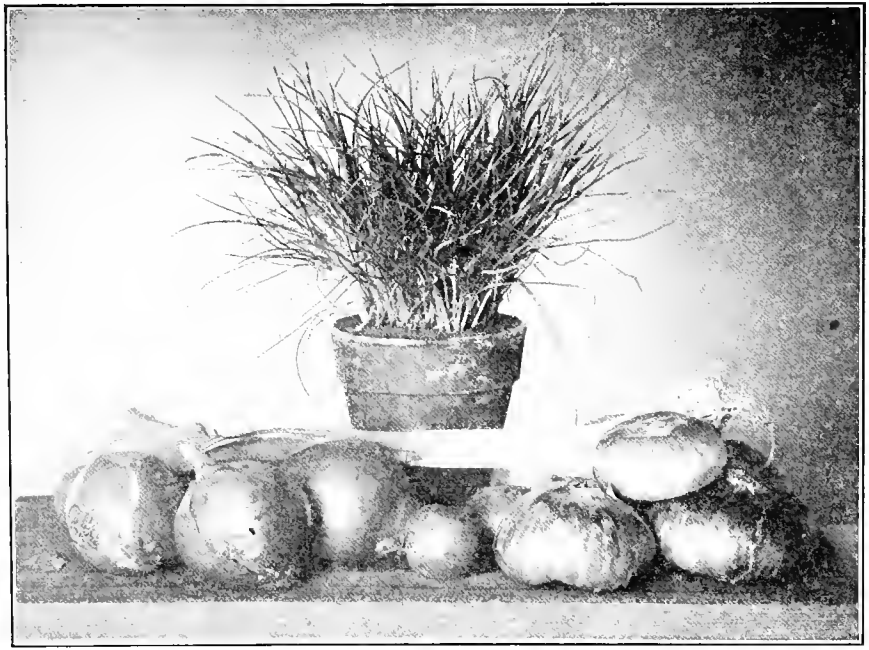
6. Make a parsnip stew in two ways, in the first, retaining the flavor in the parsnips; in the second, drawing out the flavor into the liquid of the stew. Neither salt nor soda is to be used.

7. Make any dish which shall illustrate the softening of cellulose by the use of an appropriate reagent.

8. Cook three vegetables not previously used, employing for each some one of the three methods of reducing the flavor, or some one of the three methods of retaining it, discovered by your previous work.

References

Bailey. Sanitary and Applied Chemistry, Chap. XVI.
Church. Foods, Part II.
Conn. Bacteria, Yeast, and Molds in the Home, see Index.
Hutchison. Food and Dietetics, Chaps. XIV and XVI.
Jordan. The Principles of Human Nutrition, Chap. XVI.
Knight. Food and Its Functions, Lesson 34, and page 60, Combe's tables on the digestibility of foods.
Parloa. Home Economics, see Index.
Sherman. Chemistry of Food and Nutrition, pages 234–6, 242–4 285 *ff.*, 342–4. (Ed. 1920.)
Snyder. Human Foods, Chap. III.
Thompson. Practical Dietetics, see Index.
Wiley. Foods and Food Adulterants, Part VI.
Bulletin 245, U. S. Dept. of Agriculture, Office of Experiment Stations.



EAT ONIONS IN MAY, AND ALL THE YEAR AFTER PHYSICIANS MAY PLAY

CHAPTER IV

THE EFFECT OF SUGAR ON CELLULOSE

THE PRESERVATION OF THE COLOR OF FRUITS AND VEGETABLES

THE JELLYING PRINCIPLE IN FRUITS AND VEGETABLES

Apple Compote

Boil together for 10–15 m. one cup of granulated sugar and one cup of water. If a scum arises this should be skimmed off. Cook in this syrup until tender one or more tart apples, previously cored and pared. A few cloves, or a bit of stick cinnamon may be cooked in the syrup to give flavor. Remove the apples when tender, fill the cavities with some bright jelly, and cook down the syrup until somewhat thick, pour over the apples, and serve with whipped cream (see recipe).

Make a second dish of apples cooked in water alone, adding the sugar to the liquid in the saucepan after the apples have been removed. Soft or distilled water should be used.

Compare the appearance, consistency, and flavor of the apples cooked in both ways. Save a portion of the first dish for examination later.

To Whip Heavy Cream. Beat the cream in a large bowl with a Dover beater until it is thick. If the cream is very heavy the bowl should be chilled by standing it in ice water, and the beating should not be too vigorous, lest the cream turn to butter. Sweeten and flavor to taste

just before the whipping is completed. One-fourth as much of sugar as the volume of cream before whipping is sufficient to sweeten. A half-pint of cream will be enough to garnish thirty or more apples.

APPLE COMPOTE GARNISHED WITH WHIPPED CREAM

Ginger Pears

Ingredients. Pears, sugar, water, ground ginger.

Proportions. Equal quantities (by weight) of pears, sugar, and water. The pears should be weighed after being cored and pared. A pint of water is estimated to weigh a pound; a pound of granulated sugar measures practically a pint. Allow a tablespoonful of ground ginger to every cup of sugar.

Method. Boil water, sugar, and ginger together for 15–20 m. Add the pears, and cook until they are transparent.

NOTE. The thin, yellow rind of one lemon, if boiled with the syrup, improves the flavor of this dish. The juice of the lemon may be added when the whole is cooked. Ginger pears may be used as an accompaniment to meat, as a substitute for sweet pickle.

Repeat this dish, adding the sugar after the pears are cooked.

Compare the results in the finished products. Save a

portion of the first dish for comparison with the apple compote after the lapse of a few days.

Cranberry Sauce

Measure the cranberries. Measure half as much sugar as cranberries, and half as much water as sugar.

Method I. Boil cranberries, water, and sugar together, and keep closely covered during the cooking.

Method II. Cook cranberries and water together until the berries are tender. Remove from the fire and add sugar. Keep saucepan uncovered during cooking.

Which sauce is the sweetest? Which is the brightest in color? In which are the berries the tenderer? What parallel results have you found in making the apple compotes? the ginger pears?

Green Peas

Put on in boiling, slightly salted water, and cook, uncovered, until tender. Drain, season with butter, salt, and pepper, and serve hot.

Cook another portion of peas in a similar fashion, but keep them closely covered during cooking.

Compare both dishes of peas. What similar results have you found in the cooking of another dish in this lesson?

NOTE. Bright cubes of carrot, young beets, or any of the green-leaved vegetables may be substituted for the peas, if these are not available.

Apple Jelly

Wash a sound apple, and cut it into quarters or eighths without paring or removing the core. Cook it in barely enough water to cover, until tender. Then mash

it, and strain the juice through a jelly-bag. Boil the juice with an equal quantity of sugar, until when a little is dropped on a plate it "jells." It may take from 20–30 m. Pour into glasses at once.

Proceed as before, omitting the use of sugar.

Compare the two. What is the effect of the sugar? Let stand for a few days and note any further differences.

EFFECT OF PROLONGED COOKING OF FRUIT JELLY

Choose a large, sound apple, and proceed as in Apple Jelly. As soon as jelly is formed pour off about half into a glass to "set," and continue to boil the remainder for from 30–60 m. longer.

Compare the consistency of the two portions.

Jelly from Apple Parings *vs.* Jelly from Apple Flesh

Make two portions of jelly, one from the parings alone of one or more apples, the other from the flesh of the same apples.

Compare the two as to color, consistency, taste.

NOTE. A more correct basis for comparison will be found if an equal weight of parings and flesh be used for the two jellies.

Jelly from Turnips or Carrots

Proceed as for Apple Jelly, omitting the use of sugar. Compare the result with the jelly made from fruit.

TOPICS FOR STUDY OR DISCUSSION

1. The function of fruit in the diet. Two groups: the flavor fruits and the food fruits; examples of each.
2. The main differences between "fruits" and "vegetables," as the terms are generally used.
3. Fruitarian diet. The raw food diet.
4. The pectin bodies.

5. Levulose: how formed; its sweetening property as compared with that of cane sugar.

6. The manufacture of fruit jellies; the canning and preserving industries. The Pure Food laws in their bearing on these.

7. Preserving fruits and vegetables in the home. In what circumstances this is advisable, and under what conditions it may be an unwise expenditure of time and energy.

QUESTIONS

1. Enumerate the principles of food preparation which you have so far gained from your work.

2. What fresh fruit yields the largest number of calories per pound? (See charts, Appendix A.)

3. Account for the fact that a pound of strawberries contains more water than a pound of milk, yet milk is a liquid and strawberries are not. What other fruits or succulent vegetables contain more water than milk? (See charts.)

4. Considering the cost in relation to the calorific value of fruits and green vegetables, what justifies their use in the diet?

5. Why may unripe fruits better be used for jelly-making than over-ripe fruits?

6. If three pounds of sugar were needed to sweeten a kettle of cranberry sauce made by Method II, how much would be needed to obtain the same degree of sweetness if the sauce were made by Method I?

EXERCISES

1. Demonstrate by two methods of cooking some vegetable substance the effect of sugar on cellulose.

2. Make a dish which shall show the effect of cooking sugar with an acid

3. Show, by the cooking of some bright-colored vegetable, the effect of keeping the vegetable closely covered during cooking.

4. Proceed as in 3, using some bright-colored fruit.

5.Try the effect on the color of fruit of cooking it in: (1) a sugar solution; (2) ordinary water; (3) distilled water.

6. Make candied yams, or candied sweet potatoes. What principle is illustrated in this dish?

7. Make a sweet pickle of any suitable fruit. What principle is illustrated here?

8. Using some other fruit, make a dish similar to Ginger Pears, and devise some method of testing whether the ginger exercised an antiseptic action.

9. Ask your instructor for a sample of fruit preserved by the addition of some harmful or deleterious substance, and apply the tests for the discovery of this substance.

10. Using one kind of fruit, apply to several samples of it as many as possible of the methods of home preservation, and set the results away for later examination.

References

Bailey. Sanitary and Applied Chemistry, Chap. XVII.
Chittenden. The Nutrition of Man, p. 290–1. (Ed. 1907.)
Church. Foods, Part II.
Conn. Bacteria, Yeasts, and Molds in the Home, see Index.
Hutchison. Food and Dietetics, Chap. XIV.
Knight. Food and its Functions, Lesson 8.
Lusk. The Science of Nutrition, see Index.
Parloa. Home Economics, see Index.
Sherman. Chemistry of Food and Nutrition, see Index, ed. 1920.
Snyder. Human Foods, Chap. IV.
Thompson. Practical Dietetics, see Index.
Wiley. Foods and Food Adulterants, Part VI.
Farmers' Bulletins 203, 293, U. S. Dept. of Agriculture, and Bulletins 107 and 132, Office of Experiment Stations, U. S. Dept. of Agriculture.
Richards. Food Materials and their Adulterations.

CHAPTER V

EGGS

Test for Freshness. Place perfectly fresh eggs (under 24 hours old if possible), ordinarily fresh eggs (perhaps a week old), rather stale (2–3 weeks), and very stale eggs (a month old or more) in a large bowl or a battery jar containing a saturated solution of common salt.

Remove them to a vessel containing a 10 per cent salt solution.

Remove them to a vessel containing faucet water.

Remove them to a vessel containing pure (distilled) water.

Observe in which of the solutions the eggs sank most readily.

Weight and Volume of Eggs. Ascertain by weighing (*a*) the number of eggs of average size in one pound; (*b*) the weight of a single egg of average size; (*c*) the weight of the shell; (*d*) the volume of one egg; (*e*) the volume, respectively, of the yolk and the white of one egg.

STUDY OF EGGS IN COOKING

Soft and Hard-cooked Eggs

Select five eggs of equal size. Place No. 1 in one pint of boiling water in a saucepan. Remove from fire, cover, and let stand in a warm place 20 m.

Place No. 2 in a quart bowl, pour over it one pint of boiling water, cover, and let stand for 8–10 m.

Place No. 3 in one pint of boiling water, and let it boil rapidly for 3 m.

Place No. 4 in one pint of cold water, and let it come to a boil.

Place No. 5 in one pint of boiling water, and let it boil rapidly for 20 m.

Cut the eggs open with a knife, and compare the result of the different methods of cooking on the yolk and on the white.

NOTE. This work can be divided among five students, and planned so that the eggs may be ready for comparison at the same time, *e.g.*, No. 2 should be started 12 m. after No. 1, No. 3 started 5 m. after No. 2, etc.

After comparison the eggs may be seasoned and eaten on toast, either with or without the addition of a cream sauce.

Creamed Egg on Toast

Make a half-cupful of medium white sauce (see page 9), and chop into it the hard-boiled egg from No. 5. The mixture can then be served on a freshly made piece of toast.

Compare the solubility of the hard-boiled white and yolk as they were stirred into the sauce.

Egg Lemonade

Ingredients.

1 egg.
Juice half a lemon.
2 tablespoonfuls sugar.
1 cup milk or water, either hot or cold.

Method. Beat the egg, stir in the lemon juice (note the effect), then beat with a fork until thin. Add the

sugar, then the milk or other liquid, beat all together, and pour over chopped ice in a tall glass, if it is to be used cold. If a warm drink is preferred the milk or water can be heated, and the sugar dissolved in the hot liquid before it is added to the egg.

Note the effect of the lemon juice on the egg; note also the effect of beating after the lemon juice was added.

Soft Custard

Ingredients. The essential ingredients are eggs, milk, water, sugar, salt. Optional: liquid flavoring extract, dry coffee, cinnamon, cloves, caramel, etc.

Proportions. Four to six whole eggs, or six to eight yolks, to one quart of milk. One-half teaspoonful of salt, and three-quarters of a cup of sugar to the same quantity. One or two tablespoonfuls of water to each egg.

Method. Beat the eggs with the water, add the sugar, then the milk, mixing well. Cook at a low temperature, or in a double boiler, until the custard is creamy. It must be stirred constantly while cooking.

NOTE. 1. If soft custard curdles it can be beaten smooth with a Dover beater, provided this is done immediately.

2. Dry flavors can be cooked with the custard, or boiled in the milk and then strained off. Liquid extracts may best be added to a soft custard after cooking.

3. A delicious variety is obtained by pouring the soft custard over sliced oranges, or mixing it with crushed and sifted macaroons.

Individual custards may be made by each student on the basis of one-half or three-quarters of a cup of milk. Some should be made with hot, and some with cold milk, and the flavor and texture compared.

Baked Custard

The ingredients, proportions, and methods of mixing are the same as for Soft Custard. The baked custard is cooked by means of oven poaching.

To Poach in Oven. Set the baking dish in a pan of hot water in the oven, the water to reach as high as the level of the mixture in the dish. For a very delicate custard the water in the pan should not be allowed to boil.

What principle of cooking is here applied?

To Test when Cooked. A knife-blade thrust into the center of the custard comes out clean.

Individual custards may be made by each student on the basis of one-half cup of milk. These custards should be made in three ways, namely, with the yolk alone, with the white alone, and with the whole egg. The same volume of each should be used, and the results compared as to flavor, consistency, and time occupied in cooking.

Meringue for Custards

Ingredients. White of egg, powdered or fine granulated sugar, salt, flavoring.

Proportions. A pinch ($\frac{1}{16}$ teaspoonful) of salt, and two tablespoonfuls of sugar to each egg. Flavoring to taste.

Method. Sprinkle salt on the white, and beat it stiff. Add the sugar gradually, beating it well in. Add the flavoring, and beat until smooth.

The meringue can be piled on the top of the soft custards when cold (why?), and the baked custards when cooked. In the latter case the custard may be returned to the oven for a few moments to brown the meringue.

Molded Eggs

Beat one egg, season with salt and pepper, and mix with twice its volume of milk. Divide the mixture into two parts, A and B. Pour A into a well-greased baking cup, set this into a saucepan of cold water, and cook until egg is firm. Proceed in the same manner with B, only in this case set the baking cup into directly boiling water, and cook until egg is firm. Unmold each on a lettuce leaf, and serve with broiled or baked tomatoes, or tomato sauce (see page 16).

Compare the flavor of the dish cooked at initial high temperature with that cooked by gradually increasing heat. What other comparisons on this basis can you make from the work of this lesson?

FOAMY OMELET

Foamy Omelet

Ingredients. Eggs, milk or water, seasoning, butter or oil to grease pan.

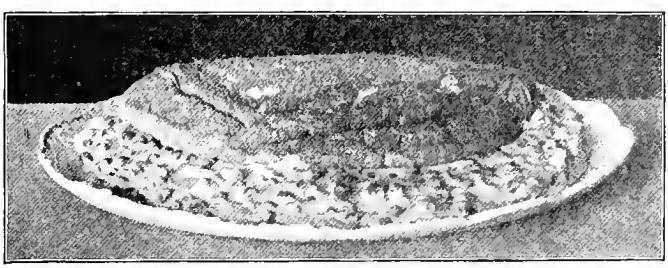
Proportions. One tablespoonful of milk or water to each egg; seasoning to taste; one teaspoonful, or less, of butter.

Method. Beat the yolk until thick, add the milk, and mix well. Season with pepper. Beat the white until stiff; add the salt while beating. Place the pan over the fire

to melt the butter, cut or fold the white into the yolk, pour the mixture into the pan, and cook until just "set." The pan may be placed in the oven for a moment to dry the upper surface of the omelet. While still in the pan one-half of the omelet is turned over the other half by slipping a broad knife under the section farthest from the handle and turning it over on the other section. The omelet is then inverted on a hot platter and served at once.

NOTE. Variations on the simple omelet may be made by such savory additions as mushrooms, oysters, chopped meat, fish or fowl, grated cheese, herbs, etc. Or such sweet additions as jelly, fresh or preserved fruits, sugar, honey, nuts, etc., may be used. These various additions are usually spread on the surface of the omelet before one-half is turned over the other. Or they may be cut or folded into the beaten white, or mixed with the yolk, or used as a garnish.

Make a second omelet, using water instead of milk. Compare both as to flavor and consistency.



FOAMY OMELET GARNISHED WITH PEAS

Experiments to Aid or Confirm Inferences

I

Behavior of Yolk and White of Egg toward Reagents used in Cooking

1. Take two test tubes, A and B, half filled with pure water. To A add 4–5 cc. white of egg; to B add 4–5 cc. of

the yolk. Shake well. Filter into clean test tubes. Heat filtrate.

2. Place enough white of egg in a test tube to cover the bulb of a thermometer when this is inserted. Hold the test tube in a beaker of cold water over the Bunsen flame, and as the water heats take the thermometer reading at the following points:[1]

(*a*) At the first cloudy appearance.

(*b*) At the formation of a tender jelly.

(*c*) At the formation of a solid mass.

Treat the yolk of egg in a similar manner, testing at (*a*) for the first coagulated flecks, and at (*b*) and (*c*) for the same condition produced in the white.

3. Treat a little white of egg on a watch glass with a drop of hydrochloric or acetic acid. Treat a little of the yolk in the same manner.

II

Difference in Composition of Yolk and White of Egg

1. Into two test tubes place, respectively, small portions of the white and the yolk of egg. Add to each about twice its volume of ether or chloroform. Shake vigorously. Pour filtrate on absorbent paper. Have you found some substance in one which is not perceptibly present in the other? What is this substance?

III

Effect of Manipulation on Yolk and White of Egg

1. Vigorously shake small quantities of the white and yolk of egg in test tubes to see which will form a froth. A few drops of water may be added.

[1] The temperature of the water will approximately correspond to that of the scalding, simmering, and boiling points which it is assumed have been studied in an elementary course.

TOPICS FOR STUDY OR DISCUSSION

1. The so-called "perfect" foods, why they are thus named, in what respects they are deficient.
2. Comparison of the function of the yolk and the white of the egg. The relation of this function to their use in the diet.
3. The proteins in egg, the fats, the salts.
4. Effect of cooking on the digestibility of eggs. The digestibility of raw *vs.* lightly-cooked eggs. The three phases of digestibility, *i. e.*, time, ease, and completeness. Further consideration of the digestibility of eggs under these headings.
5. Iron and other minerals in organic *vs.* inorganic form.
6. The different combinations of sulphur in the yolk and in the white of the egg. Their bearing on the use of eggs in the diet, particularly in diet for the sick.
7. The specific gravity of a fresh egg. The causes of the putrefaction of eggs. Results of this putrefaction.
8. The cold storage of eggs: legislation affecting this.
9. Various methods of preserving eggs.
10. The eggs of other birds which are used as food. Structure of the egg.
11. Poultry farms, breeds for laying, etc.

QUESTIONS

1. Why did the stale eggs float? Discuss fully.
2. How many eggs would be needed to furnish a cupful of whites? a cupful of yolks?
3. In which of the eggs in your first study (Soft and Hard-cooked Eggs) was the yolk the harder? In which the white? Account for this. What new principle in the preparation of food may be inferred? Has this principle held good in the case of vegetable foods? Cite instances.
4. Name the chief reagents used in cooking.
5. Compare the effect of water, heat, acid, and manipulation on the yolk and the white of the egg.
6. What properties of the egg were exemplified alike in

making omelet and in making custard? In making egg lemonade and soft custard?

7. Why is a little water used in making custard? Compare the use of water and milk in making omelets and custards.

8. Can you infer any reason why the white of egg can be beaten to a froth and the yolk can not? Compare the effect of stirring, beating, and cutting or folding in the dishes made in this lesson.

9. What new principle in the preparation of food have you learned from the recipe for Molded Eggs?

10. Trace the relation of the Experiments to the practical work.

11. In Experiment I, why had the filtrate to be heated to determine whether it held any substance in solution? Have you had a case when this could be inferred without heating the filtrate?

12. At the present market price, what would be the cost of the day's energy if yielded by eggs alone? What would be the cost of the day's protein?

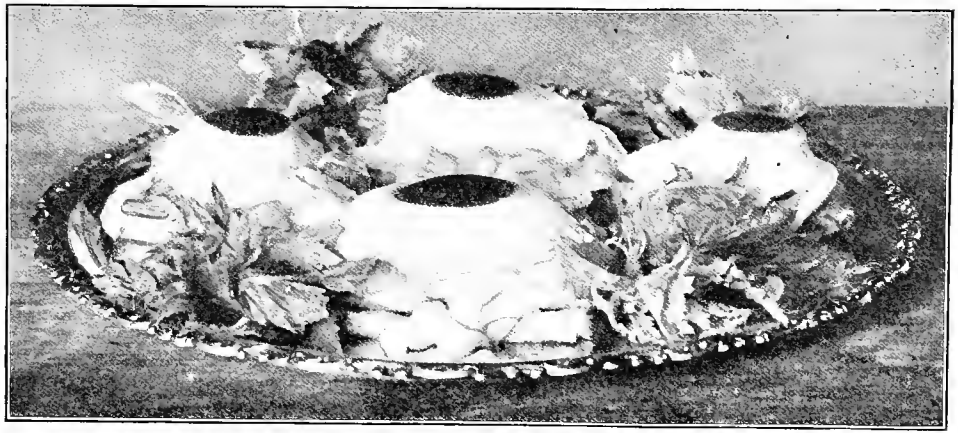
13. Suggest suitable combinations of eggs with other foods, considering proportion of nutrients, palatability, cost.

14. Compare the following methods of preserving eggs: oiling or varnishing, packing in salt, immersing in lime water, immersing in "water glass."

EXERCISES

1. Procure six new-laid eggs. Coat the shell of one with oil, pack another in salt, immerse a third in lime water, immerse the fourth in "water glass," keep the fifth in the refrigerator. The sixth may be kept at ordinary temperature for purposes of comparison. Test each in salt solutions at intervals of one week until you determine the best method of preservation.

2. Using some food of vegetable origin, make two dishes which shall show the results, respectively, of the employment of an initial high temperature and of gradually increasing heat.



POACHED EGGS WITH CREAMED CELERY ON TOAST

3. Show the results, on some food of animal origin, of cooking at an initial high temperature and by means of gradually increasing heat.

4. Make a dish to demonstrate that the yolk of egg coagulates at a lower temperature than the white.

POACHED EGG ABOVE CREAMED ONIONS IN CROUSTADE

5. Demonstrate in the making of some dish the effect of acid on albumin.

6. Scoop out a portion of the pulp from a fresh tomato, break a raw egg into the cavity, and bake in a hot oven. What principle of the preparation of food is illustrated here?

7. Construct a dish in which as many as possible of the characteristic differences between the yolk and the white of the egg shall be illustrated.

8. Make a dish which shall show the greater solubility of the cooked yolk than of the cooked white of egg.

9. By making two cakes, or other dishes, show the capacity of the white of egg to hold the air when beaten, and the lack of this property in the yolk.

10. Show, respectively, the effect of using milk and water in making some dish composed in large part of eggs.

11. Combine eggs with any one or more foods already studied so as to make a well-balanced ration and an easily digested meal. Pay especial attention to a de-

licious combination of flavors and to appetizing methods of cocking. Economy of time and money should also be taken into consideration. (Consult charts, Appendix A.)

References

Bailey. Sanitary and Applied Chemistry, Chap. XX.
Church. Foods, Part III.
Hutchison. Food and Dietetics, Chaps. VII and IX.
Lassar-Cohn. Chemistry in Daily Life, Lesson III.
Sherman. Chemistry of Food and Nutrition, Chap. IX, X, and XI.
Thompson. Practical Dietetics, Eggs, see Index.
Bulletin 28, Office of Experiment Stations, Department of Agriculture; Farmers' Bulletin 103, Department of Agriculture, etc.

CHAPTER VI

GELATINE

STUDY OF GELATINE IN COOKING

Lemon and Coffee Jellies

Measure two teaspoonfuls of granulated gelatine. Add two tablespoonfuls of cold water. Mix, and allow to stand five minutes.

Observe result. Has the gelatine dissolved?

Add to above one-half cup of boiling water in which two tablespoonfuls of sugar have been dissolved. Stir until the mixture is liquified. Divide this mixture into two parts, A and B. To A add two tablespoonfuls of coffee extract; to B, two tablespoonfuls of lemon juice. Strain both portions into glasses and set away to cool.

Note which stiffened the first. Compare the consistency of the two.

Strawberry Whip

One teaspoonful of gelatine and one tablespoonful of cold water. Let this stand five minutes, then add two tablespoonfuls of boiling water. Mix as before. Add one tablespoonful of strawberry jam or preserve. Set the mixture away to cool, and when thoroughly chilled, and beginning to "set" a little round the edge, beat it with a Dover beater until frothy and thick. Place half of this whip for a garnish on each of the glasses of jelly

already prepared. Or it may be molded and eaten by itself.

NOTE. In the above recipes more gelatine than is really needed to stiffen a mold was used, on account of the time limit in class work. More coffee and lemon juice than necessary was also used, to emphasize the effect of each.

To make Coffee Extract for Flavoring

Beat one egg in one cup of cold water. Add one cup of rather finely ground coffee, and mix. Add mixture to four cups of boiling water, allow to boil 20 m., and strain the liquid through cheesecloth, or let it drip through a jelly-bag.

Pineapple Jelly

Proceed as for Strawberry Whip, using a tablespoonful of fresh, grated pineapple, or pineapple juice. Use from one-half to one tablespoonful of sugar to sweeten.

Make a second pineapple jelly, using in this twice, or even three times the quantity of gelatine.

Make a third jelly, using canned pineapple instead of fresh, or cooking the fresh pineapple before adding it to the dissolved gelatine.

Compare the three and try to account for the differences.

Chicken Jelly, or Calves' Foot Jelly

The bones alone from either a cooked or an uncooked chicken may be used, or lacking these a portion of raw chicken, preferably from a bony part. Crush thoroughly with a mallet, place in a stew pan, and barely cover with cold water. Bring slowly to a boil, keeping stew pan closely covered, and allow to boil during the class period,

perhaps longer, keeping up the quantity of water. Strain off liquid, season to taste, and set in refrigerator until next day. A single calf's foot, skinned and cleaned, may be substituted for the chicken.

Beef Jelly

Cut into small pieces a portion of tendonous beef — preferably from the lower part of the shin or shank, where there is much gristle. From one-quarter to one-half pound will be sufficient. Proceed as for Chicken Jelly, except that this will probably need longer boiling.

EFFECT OF PROLONGED COOKING ON GELATINE

Hydrate and dissolve a quarter-box of gelatine, according to the directions on the box. Divide into two parts, A and B. With A proceed to add flavoring, etc., according to instructions. Put on B to boil, keeping up the quantity of liquid for at least an hour (if possible longer) before completing the recipe. Allow both portions to stand in a cool place until A has solidified.

Compare the two. Let both stand until next day. Compare again as to flavor and consistency.

GENERAL RULES FOR MAKING GELATINE JELLIES

1. Hydrate the dry gelatine in from four to six times its volume of cold water.

2. Dissolve it over hot water, or by adding an equal volume of boiling water to the hydrated gelatine, or by adding any hot liquid such as coffee or milk.

3. Sweeten with one-fourth as much sugar as the volume of jelly to be made, *e. g.*, a cup of sugar for a quart of jelly, etc. Exception, omit sugar wholly or in

MACEDOINE OF VEGETABLES IN TOMATO JELLY, WITH CELERY, LETTUCE AND MAYONNAISE

part when canned or preserved fruits are to be used, since these are already sweetened. Also in making a milk jelly, or a coffee jelly, most persons prefer to use only half the quantity of sugar given above.

4. Flavor with one-fourth to one-half as much liquid, *e. g.*, fruit juice, cider, wine, etc., as the volume of jelly desired. Exception, lemon; of this one-half as much as of the other flavors will be found sufficient.

NOTE. The rules given above are scarcely more than suggestions to inexperienced workers. They can be modified or adapted to individual taste, as experience directs.

COMPARISON OF COMMERCIAL GELATINE

To the Student. In this work the class should be organized into as many groups as there are brands of commercial gelatine to be studied. The groups may consist of two or more students. A table should be framed by each group, and filled out under the following heads after its particular brand of gelatine has been studied: (1) *Name*, of commercial variety. (2) *Description*—color, light or darker; texture, whether finely or coarsely granulated, shredded, in sheets, etc. (3) *Price per box.* (4) *Volume in box.* (5) *Yield in jelly.* (6) *General Characteristics, e. g.*, easy or difficult of hydration, easily or difficultly soluble, yielding a clear or a dull jelly, possessing or not possessing an acid reaction, having or not having a strong odor or flavor, and being easily affected by acid.

In order to test the gelatine four kinds of jelly should be made from each box, namely, milk, lemon, orange, and coffee. At the close of the lesson the work of all the groups should be compared, and a complete table framed. (See table on page 47.)

COMPARISON OF COMMERCIAL GELATINE

Name	Description	Price Per Box	Volume in Box	Yield in Jelly	General Characteristics
					1 ..... 2 ..... 3 ..... 4 ..... 5 ..... 6 .....
					1 ..... 2 ..... 3 ..... 4 ..... 5 ..... 6 .....
					1 ..... 2 ..... 3 ..... 4 ..... 5 ..... 6 .....
					1 ..... 2 ..... 3 ..... 4 ..... 5 ..... 6 .....

Experiments to Aid or Confirm Inferences

I

Comparison of Gelatine and Albumin

1. Compare the appearance of commercial gelatine with that of dried egg albumin. Of thoroughly hydrated gelatine with that of fresh white of egg.

2. Treat about 4 grams of hydrated gelatine and of fresh white of egg with 15–20 cc. cold water in test tubes, and allow to stand 10–15 m. Note solubility in each case.

3. Apply heat (water bath) to test tubes from 2. Note result.

4. Divide the gelatine from 3 into two equal parts, A and B. To A add enough cold water to bring up the total volume of water used to 56 cc. To B add a similar volume of a mixture of water and vinegar in equal parts. Stand both A and B in a cool place until no further change takes place.

5. Recall the effect of acid on albumin (see page 36).

6. Recall the effect of beating on both albumin (page 36) and gelatine (page 42).

7. Arrange in tabular form the effects of water, heat, acid, and manipulation on albumin and gelatine respectively. Consult instructor before framing your table.

II

Chemical Tests for Protein

1. Make a solution of egg albumin, by vigorously shaking a few cc. of white of egg in 15–20 times its volume of water. Divide into four parts — A, B, C, and D.

To A add concentrated nitric acid. Note precipitate, and its color. Boil; note change in color. After cooling add ammonia water; note further color change.

NOTE. This is known as the xanthoproteic test for albumin and other "simple proteins," and its characteristic color reactions indicate the presence of these bodies.

2. To B add a few drops of Millon's reagent. Note precipitate, and its color change when boiled.

NOTE. This is the most delicate test for protein, and will indicate the presence of even a trace of this substance by the characteristic color reaction, though no precipitate will be formed when only a minute quantity of protein is present.

3. To C add a saturated solution of magnesium sulphate.

4. To D add tannic acid or a solution of tannin.

Repeat this series of tests, applying them to solutions of gelatine of equal strength. Carefully compare the results with the results obtained in the case of albumin. What inference may be drawn from this series of experiments as a whole?

III

Action of Pineapple Juice on Gelatine and Albumin

1. Place in two test tubes 8 cc. each of gelatine and albumin prepared as in Experiment I, 2, page 48. Add to each test tube an equal volume of fresh pineapple juice, mix well, and let stand 30 m. Divide the contents of each test tube into four equal parts. Apply to each of these four portions of gelatine and albumin, respectively, the following reagents:

(*a*) The xanthoproteic test.

(*b*) A solution of magnesium sulphate (see II, 3).

(*c*) Acetic acid.

(*d*) Heat.

Compare the results in the present instance with the characteristic reactions of gelatine and albumin to the same reagents. Should you say that the pineapple juice brought about a chemical change? Is the resulting product the same in the case of the two food substances?

TOPICS FOR STUDY OR DISCUSSION

1. Sources of commercial gelatine; the various animal tissues which yield gelatine; gelatine from fish.
2. Manufacture of commercial gelatine; cause of the acidity of certain brands.
3. Digestibility of gelatine, its "acid-fixing" properties, its absorbability.
4. The function of gelatine in the body. Is it a "protein sparer"? Is it a source of energy? Is it a tissue builder?
5. "Fixed" or "tissue" (organized) albumin of body, compared with the "circulating" albumin.
6. Bromelin and other ferments.
7. Peptones and other products of digestion.

QUESTIONS

1. Under what circumstances may an extra quantity of gelatine be used for a mold? When may less than the average amount be used?
2. Account for the difference in the consistency of the coffee jelly as compared with the other jellies made on the same basis.
3. Name four possible causes for the persistent liquefaction of a gelatine jelly. How may each be treated?
4. What may be done to avoid the "curdling" of a milk jelly?
5. Estimate from your work with gelatine what is the smallest percentage of this substance that can be used to stiffen a mold.
6. What percentage of albumin is the minimum needed to stiffen a mold? (Review work with eggs.)

7. Compare gelatine and albumin as to source, composition, behavior in cooking, and function in the body.

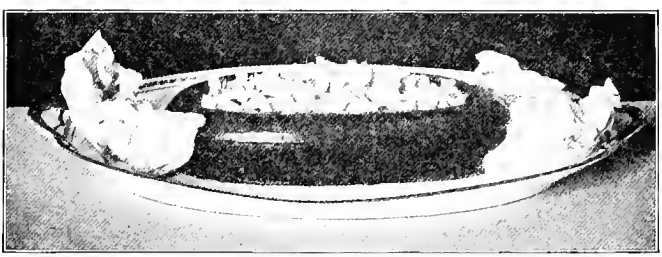
8. Similarly compare gelatine and pectin.

9. With what foods may gelatine best be combined? When is a gelatine dessert most appropriate for dinner?

10. Suggest some dietetic uses of fresh pineapple.

11. Which of the brands of commercial gelatine studied would you choose for use in the home? Which for class work? Why?

12. What are the characteristics of a well-made dish of gelatine jelly?



TOMATO JELLY IN RING MOLD, GARNISHED WITH CELERY AND LETTUCE

EXERCISES

1. Make tomato jelly in a ring; fill the center with blanched and curled celery. Improvise a ring mold.

2. Mold fruits, nuts, etc., in a given design in a clear gelatine jelly.

3. Make a ribbon jelly, using milk for one layer, yolk of egg, coffee, or strawberry preserve for the others. The milk and yolk of egg should be flavored with fruit juice.

4. Make a milk jelly flavored with lemon juice.

5. Bavarian cream is composed of gelatine jelly, flavored, sweetened, and beaten to a froth, mixed with whipped cream. Make a peach, chocolate, or lemon Bavarian cream.

6. Combine eggs and gelatine in some dish which shall

illustrate any one or more opposite properties of albumin and gelatine.

7. Make a dish which shall illustrate the hardening of albumin by heat and the hardening of gelatine by cold. The gelatine and albumin must be used in the same dish.

8. Using both eggs and gelatine in the same dish, illustrate the effect on both albumin and gelatine of beating or whipping.

9. Combine eggs and gelatine in the same dish in such a way that some characteristic property of the yolk will be counteracted by the use of gelatine.

10. Make some dish which shall show the solubility of albumin, the hardening of gelatine by cold, and its capacity of being beaten to a froth.

11. Substitute gelatine for albumin in the making of some dish where a similarity between the two renders such substitution possible.

12. Use eggs and gelatine in one dish in such a way as to show the effect of water, heat, and acid on both food substances.

13. Devise in the making of some dish a method of demonstrating the effect of fresh pineapple juice on the albumin of egg.

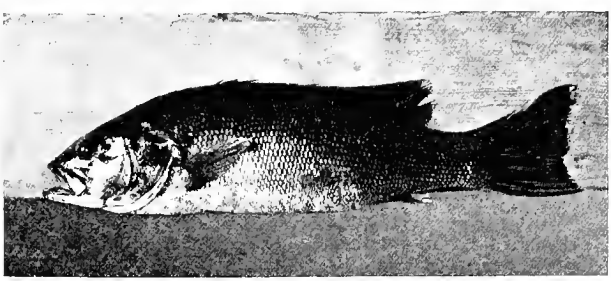
References

Hutchison. Food and Dietetics, Chaps. V and XVI.
Jordan. The Principles of Human Nutrition, Chaps. III and IX.
Lassar-Cohn. Chemistry in Daily Life, Lesson III.
Lusk. The Science of Nutrition, Chap. II.
Sherman. Chemistry of Food and Nutrition, Chap. III, and pages 403–6. (Ed. 1920.)
Parloa. Kitchen Companion, pages 702–6.
McCollum. The Newer Knowledge of Nutrition, page 171.

CHAPTER VII

FISH

To the Student. Since fish contains both albumin and gelatine, and since — as you have recently learned — these two food substances make an entirely different response to the chief reagents used in cooking, the preparation of fish for the table offers an interesting problem.



BLACK BASS

Two classes of fish are to be studied in this lesson. Catfish (sometimes called "bullhead"), eels, or salmon, may be used as an example of one class; codfish, haddock, or flounder as an example of the other class. Five methods of cooking each kind of fish should be employed, and their results compared. The Variations may be worked on by a special group of students, or assigned for another lesson, or required for home work. Consult instructor as to the omission or assignment of this work.

STUDY OF FISH IN COOKING

To Boil Fish

Lower the fish gently into sufficient boiling water to cover, and allow the water merely to bubble gently until fish is cooked.

Variation. Acidulate the water with vinegar, a tablespoonful to a pint of water, or season it further by the addition of carrot, onion, bay leaf, thyme, etc.

NOTE. The time allowance for boiling fish is usually from six to ten or more minutes for each pound. (See time table, Appendix B.) But since the time depends greatly on the shape and size of the fish — or the cut — the following test will be found much more reliable: Insert a fork between the bone and the flesh of the fish at the thickest part, and if the flesh can be lifted or separated readily from the bone the fish is cooked. To prolong the cooking further will spoil both texture and flavor.

See note following To Steam Fish.

To Steam Fish

Place the fish on a plate in a steamer, and allow it to cook for 8–10 m. to a pound, or until done. For the small quantity often used in class work, a steamer may be improvised by placing the piece of fish in a covered strainer suspended over a saucepan of boiling water.

Variation. Season the fish with salt and pepper before placing it in the steamer, or cover it with very thin strips of salt pork.

NOTE. Fish for either boiling or steaming should be placed on a plate, or in a wire basket, and this tied in a piece of netting or cheesecloth, so that the fish can be removed without being broken.

To Bake Fish

Dredge the fish with flour which has been seasoned with salt and pepper. Place it, for convenience in lifting

out, on strips of netting or cheesecloth on a greased rack in a baking pan. Bake from 10 to 12 m. to a pound, or until cooked, basting frequently with melted butter to which has been added a very little water. Or strips of fat salt pork may be placed on the fish, which in melting will furnish liquid for basting.

Variation. Add to the basting liquid for a fish of ordinary size the juice of one lemon and one teaspoonful of onion juice.

To Broil Fish

Wipe the fish dry, and brush it lightly with oil or melted butter. Place it in a double wire broiler, and broil over a clear fire, turning every other minute until both sides are a light, even brown. Remove it carefully from the broiler, using a sharp knife, if necessary, to free it from adhesions.

Variation. Add to the oil or butter with which the fish is greased a little lemon juice, vinegar, or onion juice.

NOTE. Only small fish, or larger when these are cut into fillets, cutlets, or steaks, are suitable for broiling in class work.

To Fry Fish

Wipe the fish dry, and season with salt and pepper. Roll in fine, sifted crumbs (see page 10), then dip in a mixture of beaten egg and water, two tablespoonfuls of water to one egg, roll again lightly in the crumbs, and fry from three to six minutes in deep fat. (See page 121.)

Variation. Place the fish for half an hour or more before frying it in a marinade composed of three parts of vinegar to one part of oil. (See page 117.)

NOTE. Only small fish, or larger when cut into fillets, or steaks, are suitable for frying.

SAUCES FOR FISH

Hollandaise Sauce

Ingredients and Proportions. Equal parts of unbeaten egg, butter, and boiling water. One-eighth as much vinegar or lemon juice as butter. Salt to taste, and cayenne or paprika.

Method. Cream the butter, add the egg and the other ingredients, and cook over hot water, beating all the time with a Dover beater until the sauce is thick.

Drawn Butter Sauce

Ingredients and Proportions. To each cupful of thin cream add one tablespoonful of butter and one-half tablespoonful of flour rubbed together. Seasoning in the proportion for Medium White Sauce. (See page 9.)

Method. The whole may be cooked together until the mixture comes to a boil, or the method used in making Medium White Sauce may be employed.

Piquante Sauce

Proceed as for Medium White Sauce, only instead of milk use a brown stock made by dissolving one or two bouillon cubes in as many cups of water. Add to sauce chopped onions, capers, pickles, in the proportions of one tablespoonful of each to a cup of the sauce. Add further about two tablespoonfuls of vinegar to one cup of sauce, and boil until the pickles are hot through.

TOPICS FOR STUDY OR DISCUSSION

1. Tests for the freshness of fish, danger from the use of stale fish, conditions under which ptomaines may be developed in fish.

2. Methods of preserving fish: cold storage, canning, salting, drying, etc. Commercial industries based on these methods.

3. Fish oils, fish roe, caviare, anchovy paste, and other preparations.

4. Fish considered as a "brain food." The grounds from which this fallacy arose. Nutritive value and digestibility of fish.

5. Classification of various fish on the basis of their composition. (See charts, Appendix A.)

6. Pure Food laws as they relate to fish.

7. The economics of fish culture, general legislation regarding fish and fisheries, international relations on this subject, etc.

8. The great fisheries of the United States, the great fisheries of the world, the work of the Fish Commission of the United States.

QUESTIONS

1. Compare fish with eggs and gelatine as regards its behavior during cooking.

2. What was the nature of the scum that was formed during the boiling of fish? Was this formed during any of the other processes of cooking fish?

3. Compare the effect of the five methods of cooking on the types of fish used. Which class of fish do you consider the best adapted to frying, to baking, etc.? Why?

4. Which sauce would you choose to accompany cod-fish, haddock, or any fish of this class? Which to accompany salmon, mackerel, or any richer fish? Name some other sauces appropriate to be served with fish.

5. What classes of foods should be combined with fish in order to make a well-balanced meal?

6. Discuss the place of fish in the diet, as regards economy, digestibility, and ease of preparation.

7. Give three reasons why fish culture is important from the standpoint of economics.

8. What fish is said to yield the "largest amount of nutriment for a given sum of any animal food"?

9. Why is the water content of dried codfish higher than that of fresh? (See charts, Appendix A.)

10. Considering the amount of water and of refuse in dried and in fresh codfish, which is the more economical purchase? (See charts, Appendix A.)

11. When perch is ten cents a pound and halibut is twenty cents which is the most economical purchase? State your reasons fully.

12. Taking all factors into consideration, which is the most expensive fish to purchase for food? Justify your answer.

EXERCISES

1. Make a fish chowder using milk, a fish chowder using tomato. Why is this dish called chowder?

2. Utilize left-over fish in making a fish soufflé, a kedjeree, a chartreuse, or a fish casserole. What is the origin of these different terms?

3. Ask your instructor for an illustration of fish baked in an upright position, and using a fish weighing from four to six pounds, cook this in the same manner, so that your dish may seem an exact reproduction of the illustration. Or copy the illustration on page 59.

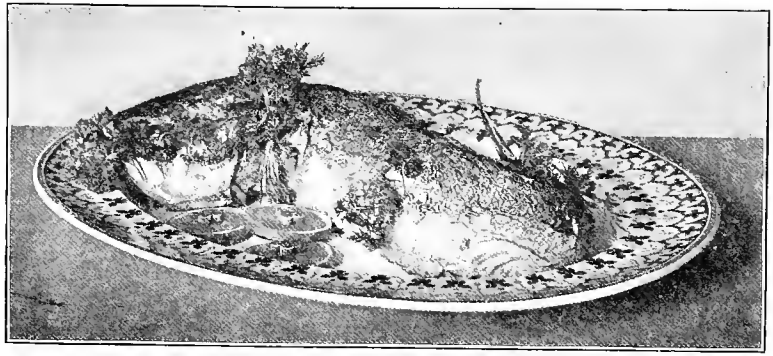
4. Make a turban of flounder, proceeding as in 3 with regard to the copying of an illustration.

5. Make a planked fish, proceeding as in 3 or 4.

6. Plan and carry out a simple dinner, sufficient for one person, consisting of fish, a sauce, two vegetables, bread and butter, and a simple dessert. The cost should not exceed twenty or twenty-five cents, and the ration should be balanced.

7. Plan and carry out a luncheon for four persons having codfish balls for the main dish. The total cost should not exceed fifty cents, and the meal should be balanced.

8. Make a dish of finnan haddie, which, with an appropriate sauce and one vegetable, shall furnish a suffi-



FISH TRUSSED IN SHAPE OF LETTER S

cient and well-balanced meal. The cost should not exceed ten cents.

NOTES. When fish are to be cooked whole, the head and tail are usually left on, but the fins should be removed.

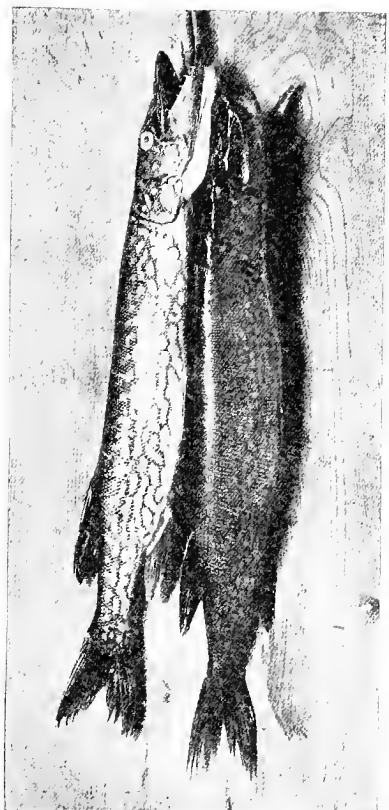
Scales can be scraped from fish by holding the knife with the blade nearly perpendicular to the skin of the fish, but slanting slightly outward, and scraping from head to tail.

Fresh-water fish are often improved by soaking them in salted water for 30 m. before cooking.

A fish platter may be effectively garnished with cress or parsley, olives or radishes, slices of cucumber or slices of lemon.

REFERENCES

Bailey. Sanitary and Applied Chemistry, Chap. XIX.
Church. Foods, Part III.
Hutchison. Food and Dietetics, Chap. V.
Snyder. Human Foods, Chap. VIII.
Thompson. Practical Dietetics, Fish.
Wiley. Foods and Their Adulteration, Part III.
Farmers' Bulletin 85, Fish as Food, U. S. Dept. of Agriculture.



PICKEREL

CHAPTER VIII

OYSTERS

To the Student. Before beginning to cook the oysters it is well to identify roughly four distinct parts whose peculiarities have an important bearing on the correct preparation of this shellfish. These are: (1) the liver, which is situated in the soft body or fleshy part of the oyster. (2) The muscle, which holds the oyster to the shell. (3) The "mantle." (4) The gills. These last, situated inside of the "mantle," furnish a test when the oyster is cooked. When they separate from one another — somewhat like the partly opened leaves of a book — and become frilled or puckered a little at the edges, the oyster is cooked, and if the application of heat is prolonged much beyond this stage there is injury to flavor and consistency.

From six to ten small oysters should be used in this lesson by each student. One is to be immersed in vinegar and allowed to stand until the close of the lesson. One is to be saved uncooked for comparison. Two or more of the various cooking processes may be applied to the rest of the oysters — arranging the work so that all of the recipes may be tried by as many groups of students as possible — and the effect of the different methods should be compared as to flavor and consistency.

STUDY OF OYSTERS IN COOKING

Oyster Stew

1 pint oysters.
1 pint milk.
2 tablespoonfuls butter.
Seasoning to taste.

Strain the oysters, and heat the oyster liquor until it boils. Add the milk, previously heated. Lastly add the oysters, the seasoning, and the butter, and cook until the gills separate and "frill."

Repeat this process, using *cold* milk, and heating the mixture until the oysters are cooked. Compare the flavor of the two dishes. What parallel result have you found in any of your previous exercises in cooking?

Repeat the process, first heating the milk, adding to it the cold oyster liquor, etc., and heating the mixture until the oysters are cooked. Compare with the first method used as to the consistency of the two dishes.

NOTE. The amount given above will serve four persons. Proportionate quantities may be used for individual experiments.

Oyster Soup

Use the same ingredients as for stew, with the addition of two tablespoonfuls of flour. Melt the butter, blend into it the flour and seasoning, add the oyster liquor, and stir until the mixture boils. Add the milk and the oysters, and cook until the oysters are done.

A little onion juice or scraped onion, or a blade or two of mace, may be cooked with the soup if the flavor is desired.

Repeat the process, adding the milk to the melted butter and flour, cooking as before, and adding the oyster liquor after the first mixture has boiled. Compare

OYSTER SOUP READY TO SERVE

the results in this case with those obtained in the similar process of making oyster stew.

NOTE. The above amount will serve four persons.

Creamed Oysters

Use the same ingredients as for oyster soup, but double the amount of flour. Proceed as in the last recipe, using the process which gave the most satisfactory results. Celery salt may be added for an extra flavoring. The creamed oysters may be served on toast, or in croustades.

NOTE. The amount given will be sufficient for eight slices of toast.

Curry of Oysters

Add to the amount of flour used in making the creamed oysters one-half teaspoonful of curry powder, or more, according to taste. Or the curry powder may be stirred in the last thing.

Oysters with Cheese

Add a couple of tablespoonfuls of grated cheese to the creamed oysters. Set in the oven in a baking dish until brown on top.

Oysters à la Poulette

Substitute for the grated cheese in the last recipe two whole eggs, or the yolks of four, well beaten, and stir these into the mixture just before it is removed from the fire. Additional seasoning should be used to flavor the eggs.

NOTE. Creamed oysters and their derivatives may be served for variety in small baking cups, lightly covered with buttered crumbs, browned in the oven, and sprinkled with chopped parsley.

Suprême of Oysters

Substitute chicken or veal stock for the milk in creamed oysters, and add just before serving a couple of tablespoonfuls of chopped mushrooms, a chopped, hard-boiled egg, and a tablespoonful or two of lemon juice. In addition to these a tablespoonful of scraped onion, or chopped carrot, or a mixture of the two, will add to the novelty and deliciousness of the flavor. Serve in a casserole, or in individual ramekins, garnished with buttered crumbs and parsley.

Further Experiments with Oysters

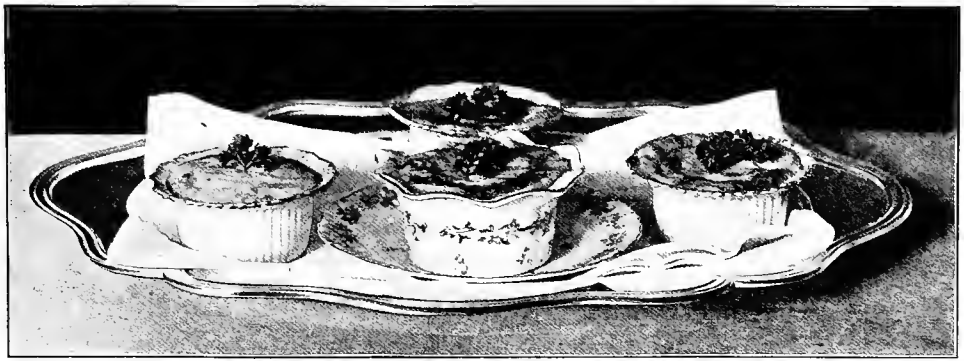
1. Take two large, plump, "floated" oysters. Cook one in distilled water, the other in a strong salt solution, until the gills separate and become frilled.

2. Take two oysters and use any preferred medium for cooking. Cook one until properly done, cook the other for five minutes longer. Compare the two.

3. Take four freshly opened oysters. Bruise the soft part of one, and set it away in a moderately warm place for from one-half to one hour. Cook the second until done, then bruise and set away as before. Place the third, without bruising, in a moderately warm place with the other two. Do not allow the oysters to touch one another. Set the third in the refrigerator. Compare the flavor, etc., of the four.

NOTE. If you should not be able to make a satisfactory inference from the first experiment, or from your cooking of oysters, the following experiment may be performed.

Half fill a gold-beater's bag with a strong salt solution, and suspend it in a vessel of pure water for one or two



SUPRÊME OF OYSTERS IN RAMEKINS

hours. Measure the volume of water in the bag before and after suspension. The water in the vessel, and the solution in the bag, should be tested for chlorides before and after the experiment. The membrane lining an egg-shell may be used instead of the gold-beater's bag.

TOPICS FOR STUDY OR DISCUSSION

1. The cultivation of oysters, and the location of the largest oyster beds in the country.
2. The best age for the marketing of oysters; how the age of this fish can be told from an examination of the shell.
3. Varieties of oysters in this and other countries.
4. The "soaking" or "floating" of oysters. The effect of this process on the healthfulness, the nutritive value, the keeping qualities, etc., of the oyster.
5. Approved methods for the shipment of oysters.
6. Harmful preservatives and other adulterations.
7. Other shellfish and crustaceæ used as food.
8. The cost of oysters as compared with their nutritive value.
9. The 100-calorie portion.

QUESTIONS

1. Compare the effect of water, heat, and acid on eggs, fish, and oysters.
2. Compare raw and cooked oysters as to flavor, digestibility, and wholesomeness.
3. What form of carbohydrate should you expect to find in oysters? In what part of the oyster is it found?
4. What is the economic value of floated oysters compared with that of unfloated? What evidence have you that the oysters used today were either floated or unfloated?
5. When may salt be used in a recipe for cooking oysters? When may it be omitted?

6. Account for the expression, "An oyster digests itself." What is the least digestible part of the oyster?

7. Compare as to nutritive value ten cents' worth of the following foods: oysters, milk, round steak, eggs. (See charts.)

8. Arrange in tabular form the cost, protein content, and calorific value of a pint of milk and a pint of oysters. (See charts.) Why do we pay so much more for one food than for the other? What justification is there for the excess in price? What relation can you trace between the comparative cost of the two foods and the recipes chosen for today's lesson?

9. What new principles in the preparation of food have you gained from the work with oysters?

10. Trace the relation between the experiments and the cooking of the various dishes made.

EXERCISES

1. Make panned oysters with lemon butter.
2. Sauté bacon and oysters together.
3. Make "Huitres au Lit," or "Pigs in Blankets."
4. Using the 100-calorie portion, combine oysters with one or more foods already studied so as to furnish a 1000-calorie meal for from seven to ten cents.
5. Proceed as in 4, balancing the meal according to the standard nutrient ratio.

References

Bailey. Sanitary and Applied Chemistry, Chap. XIX.
Church. Foods, Part III.
Hutchison. Food and Dietetics, Chap. V.
Jordan. The Principles of Human Nutrition, Chap. XVII.
Snyder. Human Foods, Chap. VIII.
Thompson. Practical Dietetics, Oysters.
Wiley. Foods and Food Adulterants, Part III.
Farmers' Bulletin 85, U. S. Dept. of Agriculture.

CHAPTER IX

MEATS

To the Student. The cooking of meat is a difficult subject to present in class, first, because in order to gain efficiency each student should use quite large joints; second, because in order to gain experience much practice is necessary. In these lessons, therefore, as much of this practical work as possible will be given, and this should be supplemented by home work in the cooking of different cuts and the use of different methods. Meat is such a costly food that the wastefulness involved in improper methods of cooking should not be tolerated.

You will perhaps question why no instructions are given regarding the seasoning of the steaks. This was omitted for two reasons: first, because the work assigned in class is largely experimental, usually designed to illustrate some principle, such as how best to cook meat evenly, to render tough meat tender, to develop flavor, etc. In testing the meat for the last you will be able to arrive at a correct conclusion much more easily if the meat is not seasoned before it is tasted. The second reason is that seasoning is so largely a matter of individual taste that scope for this individuality may well be afforded you now. Hence specified amounts of seasoning will seldom be given in the formal recipes printed in this text for the future.

Experiments in the Broiling of Steak

Tender Steak

Method 1. Trim off the exposed edges of the steak, and remove the superfluous fat. Heat a meat broiler, and grease it lightly with a piece of fat on a fork. Place the steak on the broiler with the skin edge toward the handle. (Why?) Hold it over clear, red coals, or under gas, and turn the broiler every ten seconds. The meat should be held so close to the flame that it will be immediately seared and quickly browned on both sides. When half the time for cooking has passed, reduce the temperature (why?) by holding the broiler farther from the heat, and turn it not quite so frequently. Or the steak, if thoroughly browned, may be placed on a hot platter in the warming oven until the cooking is complete.

Time for Broiling Steak. See Time-Table for Cooking, Appendix B.

NOTE. The thicker the steak the shorter proportionately should be the time allowed at the initial high temperature.

A properly cooked steak should, when cut, be of a uniform tint throughout its entire thickness.

The cooking of even a well-done steak should never be prolonged so far that the steak loses its "puffiness."

Method 2. Pan-broiling. Heat a clean, smooth pan "blue" hot, or so hot that the meat will not stick to it. Put on the steak, and keep turning it *constantly* during the first part of the time allowed for cooking. During the latter part reduce the temperature by extinguishing the gas, putting on the stove lid, or drawing the pan to the side of the range and covering it with a plate, so that the meat may be cooked by the retained heat.

NOTE. In pan-broiling, about one-third more time should be allowed than in broiling over the open fire.

Method 3. Broil or pan-broil a steak, omitting the frequent turning, that is, cooking it for half the time on one side and for half on the other.

Method 4. Broil or pan-broil a steak without reducing the temperature during the latter part of the cooking.

Carefully compare the four steaks as to juiciness, degree of cooking (whether more or less well done), whether or not evenly cooked throughout, etc.

Tough Steak

Method 1. Broil or pan-broil as in Tender Steak.

Method 2. First freeze the meat until quite stiff. This can be done by placing the meat in a shallow, closely covered kettle, applying a layer of butter or lard round the joining of the lid (to make it water-tight), and packing the kettle in a mixture of equal parts of ice and salt (coarse) for an hour. On removing the meat allow it to thaw out; then broil or pan-broil as before.

Method 3. Marinate a tough steak by immersing it in a mixture of one part of oil to three parts of vinegar (see page 117). The steak should remain in the marinade for several hours, or overnight. Broil or pan-broil as before.

Method 4. Pound a tough steak with a wooden pestle or mallet. Broil as before.

Compare, fully and carefully, the four steaks.

Hamburg Steak

Put a piece of tough steak through the food chopper, add seasoning, and if desired, chopped onion or onion juice. Form into cakes an inch or an inch and a half thick, and pan-broil as in Method 2, for tender steak.

Salisbury Steak

Scrape the pulp from raw meat with the edge of a knife, discarding the fiber. Season as for Hamburg Steak, form into cakes, and pan-broil in the same manner.

Which was the better done after cooking for the same length of time, the Hamburg steak or the Salisbury? Did the Hamburg steak take a longer or a shorter time to cook than an ordinary steak of the same thickness?

ACCOMPANIMENTS TO STEAK

Maitre d'Hotel Butter. Cream the butter, and add to it one-fourth its volume of lemon juice and the same amount of finely chopped parsley. Form into balls, and place on the hot steak just before serving.

To Chop Parsley. Twist a sprig of parsley into a tight little ball, hold this firmly on the table between the fingers of the left hand, and shave it with a sharp knife, as finely as possible.

Horseradish Sauce. Mix equal parts of grated horseradish and fine bread crumbs. Season the mixture slightly with salt and pepper, moisten it with cream, and heat it through on a hot pan. If heated on the pan used for cooking the steak the flavor will be improved, though the sauce will not look so white as if heated in an agate or enameled saucepan.

Broiled Bananas. Peel the bananas, and cut them into quarters, cutting first across, then lengthwise. Broil in an oyster broiler, or sauté in butter until soft.

A spoonful of the horseradish sauce on a Salisbury steak, with a broiled banana on the top, makes a delicious combination.

Rolled Skirt Steak

Trim a skirt steak, spread it with a well-seasoned stuffing, roll up like a jelly-roll, and skewer. Lay one or two thin slices of fat pork on the top, place on the rack of a baking pan, and bake, without the addition of any water for basting, for 45 m.

Prepare a second skirt steak similarly to the first, steam it for 25 m., then bake for 20 m., or until the whole time of cooking shall have occupied 45 m.

Compare the two steaks. Is there any difference in the flavor? in the consistency? Which is the more evenly cooked throughout?

Stuffing for Skirt Steak

Ingredients.

2 cups bread crumbs.
¼ to ⅓ cup butter.
1 egg, well beaten.
¼ to 1 tablespoonful chopped onion or onion juice.
Seasoning of salt, pepper, chopped parsley, thyme, etc.

Method. Moisten the bread crumbs with the beaten egg and the melted butter — if the bread is very dry it may need to be squeezed out of hot water before adding the butter; in this case the butter need not be melted. The seasoning may be added last, and the whole thing well mixed.

This recipe can be used for a fish stuffing by adding chopped pickles or capers, or a mixture of the two. It can be used for fowl with or without the addition of oysters — one cupful or more.

Experiments to Aid or Confirm Inferences

1. Examine a long section, and if possible a cross-section of meat under the microscope, noting the structure of voluntary muscle.

2. Test meat with litmus paper for acidity or alkalinity. Use dry litmus paper, neutral, and highly glazed. Apply it to the meat for a short time, then wash off the paper in distilled water and observe the color of the stain.

3. Scrape 8–10 grams of the pulp from a piece of lean meat with the edge of a knife, place it in a beaker, and mix it well with about 50 cc. of distilled water. Note which substances in meat are soluble and which are insoluble.

4. Place a portion of the clear, fibrous substance left from 3 in an evaporating dish, and add concentrated hydrochloric acid to cover. Allow to stand for 30 m. Note any changes that have taken place in appearance, in texture.

5. Strain the liquid from 3 through cheesecloth, and squeeze the pulp as dry as possible. Taste both the pulp and the liquid. Has either one a flavor of meat?

6. Heat the liquid very slowly in a beaker, without stirring, until no further change takes place. Do you find that some of the portion soluble in water is coagulated by heat? What other changes were brought about by heating? Filter or decant the liquid. Does it still hold something in solution? Boil the liquid until it is reduced to one-half its volume, or less. Taste the residue on the filter paper. Taste the liquid after boiling down. Has either one a flavor of meat?

7. Wash thoroughly the pulp from 5, then heat it and

taste it. Has it a flavor of meat? Is there any change in the flavor after heating?

8. Heat very quickly and at a high temperature a cubic inch of lean meat until it puffs up a little. Then express the juice from it by means of a meat press, and divide this liquid into two parts. Add acid to one part, apply heat to the other. Compare the result of each. What substance already dealt with reacted similarly to heat and acid?

9. Test the various substances isolated for protein, using both the xanthoproteic test and Millon's reagent.

10. Shake up together in a test tube a little scraped lean meat with twice its volume of ether. Let it stand for a moment to settle, then decant the liquid on to a piece of filter paper. Does lean meat contain some fat?

TOPICS FOR STUDY OR DISCUSSION

1. The names and location of the various steaks in the beef animal.
2. How to choose good beef. Sources of the best beef.
3. Effects of the "hanging" of meat. *Rigor mortis.*
4. The effect of feeding, care, etc., on the flavor of meat.
5. The physical structure of meat.
6. The nutrients and non-nutrients contained in meat. The characteristics of the protein of meat.
7. Various animals used for food. Cost of production of beef. Imports and exports of meat. Cause of increased cost of meat.
8. Appropriate accompaniments to beef — vegetables, sauces, desserts, beverages.
9. Vegetarianism *vs.* mixed diet from the standpoint of economy.
10. How the protein content of foods is estimated; discussion of various methods.
11. Dangers of excessive meat eating. Results, in

different physical conditions, of a total exclusion of meat from the diet.

QUESTIONS

1. Compare the structure of meat with that of an orange. In what points are they alike? in what points do they differ?
2. Why are steaks cut across the direction of the muscle fibers? What steaks are not so cut? Describe these, and suggest ways to serve them.
3. So far as you are able, name and describe the different substances you have found in meat. In which of these does the flavor of meat reside?
4. Which of the constituents of meat is most affected by acid? by water? by heat? In each case, what is the reaction?
5. Account for the "puffiness" observed during the cooking of steak. Account for the effects of freezing.
6. Discuss the causes of toughness in meat. From what parts of the animal should you expect the tenderest cuts?
7. Compare the probable effect on meat of (1) violent exercise, or hunting, of the animal before slaughtering; (2) prolonged hanging of the meat before its sale; (3) the application of a marinade by the housekeeper before cooking. (See Chapter XIII, page 117.)
8. Trace the relation between the experiments in analysis of meat and the cooking of meat in today's lesson.
9. What new principles in the preparation of food have you gained from the work of this lesson?
10. What agents have you recognized so far as serving for poor conductors of heat in the preparation of food?
11. What are the possible errors in the estimation of protein by factor? In what foods is this method most likely to be erroneous?
12. Account for the fact that the protein content of veal is greater than the protein content of beef. (See charts.)

EXERCISES

1. Make a diagram of the beef animal, indicating the different cuts by numbers. Make a key to this diagram, giving the names of the cuts, their cost at retail, and the various purposes for which they may be used.

2. Make drawings of the different steaks from both the hind quarter and the fore quarter. Name the location, the average weight, and the cost per pound of each steak.

References

Jordan. The Principles of Human Nutrition, Chaps. III and XVI, and pp. 349, *ff*.

Crichton-Browne. Parsimony in Nutrition.

Hutchison. Food and Dietetics, Chaps. IV and X.

Jordan. The Principles of Human Nutrition, Chap. III.

Kellogg. Shall We Slay to Eat?

Parloa. Home Economics, Chap. IX.

Sherman. Chemistry of Foods and Nutrition, see Index, ed. 1920.

Snyder. Human Foods, Chap. VIII.

Thompson. Practical Dietetics, Meat.

Wiley. Foods and Food Adulterants, Part I.

Woods-Hutchinson. Instinct and Health, Chaps. II and III.

Bulletin 141, Losses in Cooking Meat, U. S. Dept. of Agriculture; Farmers' Bulletin 34, Meats: Composition and Cooking; also Bulletins 102, 162, 193, U. S. Dept. of Agriculture, Office of Experiment Stations.

CHAPTER X

MEATS — *continued*

To the Student. All of the cooking processes described in this chapter can be completed, for the weight of meat assigned in each case, during the ordinary double period devoted to the laboratory work of this course. Different groups of students can be formed for the preparation of each joint, etc., but each group should observe not only the work of its own, but that of every other group in the class.

The vegetable dishes given may be used as accompaniments to the meats, and can be prepared in "chinks" of time while the meats are in process of cooking.

Attention should be paid to the serving, garnishing, and carving of the meats.

The meat used must in every case be weighed both before and after cooking.

Standing Rib Roast

Select a cut from the first two ribs, the weight not to exceed four pounds. The roast should be prepared by sawing off two or three inches from the thin ends of the rib bones, and the saw should be slanted well in under the meat to avoid unsightly exposure of the bone from shrinkage of the meat during cooking.

Place the meat on the rack in a roasting pan, and dredge it lightly with flour, seasoned with salt and pepper. Set it into a very hot oven for 10–15 m., to sear the

surface. Then baste well with hot water, mingled with the fat in the pan; (if the beef is lean some dripping or suet should be added to the pan to make fat for the basting). The basting should be repeated every 10 or 15 m., until the joint is cooked. While there should be a

STANDING RIB ROAST — AS PURCHASED

sufficiency of liquid for basting, there should not be so much as to generate an excess of steam, since this would prevent the browning of the meat, as well as hinder the development of flavor. (Why?) When the joint is cooked (see time table, Appendix B), pull out the small pieces of bone from the thick end of the roast (if the meat is done these can be removed easily), place it on a hot platter, garnish, and set before the carver with the thick end to the left.

NOTE. The meat from the cut-off ends of the ribs can be used with the "left-overs" in making croquettes, shepherd's pie, or any of the various forms of re-serving. Or they can be cooked as "short-ribs" if desired. But the joint looks sightlier, and is easier to carve, when the unnecessary length of rib bone is removed.

STANDING RIB ROAST, COOKED AND READY TO SERVE

Braised Beef

A piece from the bottom round, weighing about two pounds, may be used for the class work. If very lean, fat will have to be added by one of the approved methods. (See Methods of Applying Fat to Meat.)

Sear the whole surface of the meat in a very hot pan until it is well browned. Place it on the rack in a braising pan, pour in hot water just to reach to the rack, and cook in a slow oven for from one-half to one hour to every pound, keeping the pan closely covered.

Onion, carrot, turnip, celery, cut in dice, one cupful or more of each, according to the amount of meat to be braised, may be piled around the joint in the pan, and afterwards served with it. Seasoning and herbs may also be added. When the meat is cooked the liquid should be strained, thickened with flour (see To Thicken and Season Stew, page 90), and served as a sauce. The vegetables may be arranged around the meat on the platter.

Vegetables are not essential to the braising process, but will give added flavor to the meat. When they are used this dish is sometimes called "braised meat à la jardinière," or " à la printanière."

Pot Roast

This method of cooking meat is similar to braising, and is employed in the absence of a regular braising pan. The meat, previously seared, is placed on a bed of vegetables in an ordinary kettle; a very little water is added — just enough to keep the vegetables from burning — and the whole is cooked, closely covered, on the top of the stove.

NOTE. Since the braised meat is cooked by a combination of roasting and steaming it is not necessary to baste it, and the braising pan should remain covered during the whole time of cooking. The slower the cooking process is the tenderer and better flavored will be the meat. The class exercise in braising has to be completed in too short a time to give the best results.

Methods of Applying Fat to Meat

Meat which is dry and lean, especially if subjected to prolonged cooking, is much improved by the addition of pork fat. This may be added in three different ways.

1. **Barding.** This is the simplest method, and it consists in placing thin slices of pork fat on the upper surface of the meat. They may or may not be fastened with skewers. The fat in melting serves to baste the meat, will prevent evaporation of the juices, and will enrich the flavor.

2. **Daubing.** Strips of pork fat about a half-inch thick are pushed into the meat through cuts made here and there with a sharp, thin-bladed knife. The strips of pork,

which are called lardoons, should extend through the entire thickness of the meat.

3. **Larding.** Long, slender strips of pork fat, about one-quarter of an inch thick, are drawn through the surface of the meat by inserting one end of the strip into the end of a larding needle, and then, with the point of the needle, taking a stitch through the surface of the meat. The stitch should be about an inch long, and almost a half-inch deep, and the lardoon should project on both sides. Regular rows of these stitches should be made all over the surface to be larded, and the ends of the lardoons should be cut an equal length.

Pork fat for larding or daubing should be cut as close to the rind as possible, and lengthwise with the rind, since the fat here is firmer, and will not be so apt to break.

Either fresh or salt-pork fat may be used, and for the class exercise both kinds should be tried, and the result compared and accounted for — since the salt-pork fat has an interesting effect on the muscular tissue of the meat where it comes in contact with it.

Beef à la Mode

This resembles Pot Roast, except that more water is used in the cooking, the water being allowed to reach to half the height of the meat in the pot. The searing, in beef à la mode, may be done simply by pouring boiling water over the surface of the meat. The round of beef is generally used, and it is liberally daubed with fat.

Veal Birds

Take cutlets of veal from the upper part of the leg, cut half an inch thick. Pound these with a wooden mallet

until reduced one-half in thickness. Cut the meat into strips about four inches long and two wide, spread each strip with stuffing (see Chapter IX, page 74) to which has been added the trimmings of the veal, finely chopped, with a little ham or bacon. Roll each strip up like a jelly-roll, fasten with wooden toothpicks, and bake, or cook in a hot, slightly greased pan.

VEGETABLE DISHES

Deviled Tomatoes

Cut fresh tomatoes into thick slices, dredge them with flour, salt, and pepper, and cook in hot butter on a pan until thoroughly heated. Serve on a hot dish with one tablespoonful of the following mixture on each slice.

1 tablespoonful butter.
1 teaspoonful powdered sugar.
2 teaspoonfuls dry mustard.
Yolk of one hard-boiled egg.
Salt, and a dash of paprika, or a few grains cayenne.

Mix the above ingredients to a cream, then add:

2 tablespoonfuls chopped green pepper.
2 tablespoonfuls scraped onion.
2 tablespoonfuls finely shaved parsley.
Vinegar to moisten.

Slightly warm the whole in a pan, then place on the sliced tomatoes.

Mushrooms and Tomatoes

Sift canned tomatoes, and make into a sauce (see page 16). Add half the volume of chopped mushrooms, and cook until hot. Add fine, sifted crumbs until the mixture is of the consistency of a thick paste.

Tomato Curry

Cook one tablespoonful of scraped onion in two tablespoonfuls of butter until it turns yellow. Add one sour apple, chopped, and cook until apple is soft. Add two cups of sifted tomato, one to two teaspoonfuls of curry powder, and seasoning of salt and pepper. Allow the mixture to boil, then add one cup of boiled rice, cook five minutes longer, and serve.

Mississippi Steamboat Potatoes

Pare raw potatoes, and cut into one-inch cubes. Boil in strongly salted water until just soft enough to pierce. For one pint of potato cubes use:

2 tablespoonfuls butter.
1 tablespoonful scraped onion.
1 tablespoonful vinegar, tarragon if convenient.
1 egg, well beaten.
Seasoning of salt and pepper.

Cook the onion in the butter until yellow. Add the potato cubes and toss them lightly with a fork until well coated with butter. Add the vinegar and seasoning. Add the beaten egg, and cook for a moment until the egg is set. The heat of the potatoes may be sufficient to do this. Serve at once, sprinkling over the dish a little very finely chopped parsley.

This dish, to be perfect, should have the potato cubes retain their shape after cooking, and each cube should be covered with a creamy coating of the egg.

Hot Slaw

Prepare one pint of very finely shredded cabbage. Make the following dressing:

2 tablespoonfuls butter.
2 tablespoonfuls flour.
2 teaspoonfuls sugar.
½ cup cream.
¼ teaspoonful dry mustard.
Salt, a speck cayenne, or a little paprika.

Cook as for white sauce. Add slowly one-quarter cup of vinegar, stirring constantly. When the mixture boils, stir in rapidly one well-beaten egg, and when the egg thickens add the shredded cabbage, incorporate this well with the dressing, and serve immediately.

NOTE. "Slaw" means a salad, usually of shredded leaves, such as cabbage or lettuce leaves. "Cole slaw" means simply a cabbage slaw, or a cabbage salad, the word "cole" being equivalent to "cale" or "kale." "Cold Slaw" is the term usually applied to a cabbage salad that is served with a cold dressing — but there is really a hot cole slaw as well as a cold cole slaw.

GREEN PEPPERS, FARCI

Green Peppers, Farci

Cut the tops from green peppers, scoop out the inside, and boil for five minutes. Fill cavities with a spoonful of the following mixture.

½ cupful each cold cooked veal and cold ham, both minced.
½ cup bread crumbs.
¾ cup of cream.
1 tablespoonful butter.
Seasoning salt, onion juice, minced parsley.

Set the pepper cups in the oven and bake for half an hour, basting with water and butter, one tablespoonful of butter to one cup of water.

TOPICS FOR STUDY OR DISCUSSION

1. The names and location of the prime roasting pieces in the beef animal, of the fancy cuts, *e. g.*, the fillet. The names and location of pieces suitable for braising, for corning, etc.

2. Methods of preserving meat, smoking, drying, corning, canning, cold storage, etc. Ptomaines and bacilli in meat. Meat inspection and other food laws concerning meat.

3. Nomenclature of proteins according to the classification by the committee on nomenclature representing the Association of Agricultural Colleges and Experiment Stations.

4. Nomenclature of proteins according to the recommendations of the joint committee of the American Physiological Society and the American Society of Biological Chemists.

5. By-products of the digestion of proteids.

6. Nucleo-protein *vs.* nucleo-albumin.

7. Vegetarianism *vs.* mixed diet from the physiological standpoint.

QUESTIONS

1. Account for the loss of weight in cooking meat. In which kind of meat, tough or tender, was the loss the greater? Why?

2. Why do we cook tender meat? Why do we cook tough meat?

3. Why is meat dredged with flour before roasting? Has any similar process been performed by you in a previous lesson?

4. Which needs the hotter oven and the more frequent basting, a small joint or a large one? Why?

5. Account for the red color of corned beef, for the red color of the daubed or larded meat where it came in contact with the salt-pork fat.

6. Compare the corning of beef with the floating of oysters.

7. Why should meat always be carved across the grain?

8. Compare the difference, with regard to time and temperature, in the cooking of tough and tender meats.

9. What principle is involved in the common practice of applying vinegar, salt, or soda to meat which has become slightly tainted on the surface?

10. In bacon and pork, meats with a small water content, what other food principle is in inverse proportion? In what other instances does such a proportion hold good? (See charts.)

EXERCISES

1. Utilize the left-over meat in some acceptable modes of reserving.

2. Make a diagram of the pork animal. Proceed as in the diagram of the beef animal.

3. Make drawings of the first, second, and third cut of the ribs; of the chuck ribs; of the porterhouse cuts; of the top and bottom round.

References

See references for Chapter IX, with the addition of the following:
Jordan. Principles of Human Nutrition, Chaps. III and XIII.
Parloa. Kitchen Companion, Larding, etc.
Sherman. Chemistry of Food and Nutrition, pages 52–9, and 403–6. (Ed. 1920.)

CHAPTER XI

MEATS — *continued*

To the Student. The cooking of meat by means of boiling, or the use of water as a medium for conveying heat, will be studied in this chapter. Meat stews in particular will be the object of a series of experiments. It takes at least three hours to make a good stew from uncooked meat; hence, if possible, the student should start the work at least an hour before the opening of the class period. Small individual stews of not more than from two to four ounces of meat may be made, and the results compared. Both veal and beef will be used in equal parts in making the stews, preferably from the shin or shank of beef and the leg of veal. If pieces of the bone are also used this will improve the flavor.

Before beginning the work in stews and soups, a joint of meat may be cooked whole, by boiling.

Boiled Leg of Lamb

Choose a small leg, weighing about six pounds. Wipe, and put on to cook in boiling salted water, just sufficient in amount barely to cover the meat. Allow to boil for ten minutes, then simmer (180–185° F.) until cooked. (See time table, Appendix B, page 235.)

Remember to weigh the meat before and after cooking.

Caper Sauce

Proceed as for White Sauce (see Chapter II, page 9). When sauce is cooked, add a generous tablespoonful of capers to every cup of sauce. A portion of the water in which the lamb was cooked may be substituted for milk in making this sauce.

STEWS

Plain Meat Stew with Dumplings

Cut the meat into half-ounce pieces, put on in cold water, allow it to come rapidly to a boil, then reduce the temperature and simmer for two hours. Add vegetables, potatoes, turnips, cut in pieces as large as the meat, carrots in quarter-inch slices, onions sliced or finely minced, and bring the whole again to a boil. After this allow the stew to simmer for thirty minutes, then add the seasoning and thickening, and allow to boil for a minute or two. Lastly place the dumplings on the top of the meat and vegetables, and cook the stew, closely covered, for ten minutes longer.

Stew can be served in a large, deep platter, with a border of small dumplings, and garnished with cress. Or a piled-up border of well-done, dry, flaky rice may be effectively used, or a border of well-seasoned mashed potato. If potato is used the platter may be set for a moment in the broiling oven of a gas range to brown the border.

To Thicken and Season Stew. Allow two tablespoonfuls of flour for every pint of water used in making the stew. Add to this one-half teaspoon of salt and one-fourth to one-half teaspoon of pepper. Blend all with cold water to a thin paste, stir into this paste an equal volume of

LEG OF LAMB, ENGLISH OR LOIN CHOPS, RIB OR FRENCH CHOPS

the hot liquid from the stew, then pour the mixture into the stew pot, and stir until it boils.

Dumplings

Ingredients. Flour, water, shortening, baking powder, salt.

Proportions. Three times as much flour as water. One-eighth as much shortening as flour, or less. One-quarter teaspoonful of salt to each cup of flour. Two teaspoonfuls of baking powder (where a cream of tartar baking powder is used) to one cup of flour.

Method. Mix dry ingredients. Chop the shortening into the dry mixture, using the back of a fork. Stir in the liquid to the dry things, and mix very lightly to a soft dough. This should be spongy and full of holes.

NOTE. One-quarter cup of flour will make two or three small dumplings.

Dumplings are less apt to be soggy if they are cooked separately from the stew on a greased plate in a steamer.

Brown Stew

About one-half of the meat should be well browned on a hot pan before making the stew. The same process as for the plain meat stew is then followed.

Variations on Methods. Using the same ingredients as before, make both kinds of stew by putting the meat directly into boiling water, and then reducing the temperature as already directed.

Make a stew, using meat alone, allowing it to boil hard during the whole time of cooking. The water lost by evaporation must be replaced from time to time.

Make stews, using meat alone, in soft (distilled) water and in hard water, proceeding as for plain meat stew.

Compare flavor and consistency in each case.

Frame, as a result of your work, some general rules for the making of stew.

OTHER VARIETIES OF STEW

Brunswick Stew. A brown stew containing pieces of chicken as well as one or two other kinds of meat.

Chowder. A stew of fish or shellfish.

Fricassee. A stew of meat that has been browned either before or after making the stew.

Haggis. A stew made of sheep's hazlet, thickened with oatmeal, flavored highly with onion, and cooked in a bag, usually the stomach of the sheep.

Haricot. A stew of any kind of meat, cut into pieces the size of a haricot bean.

Irish Stew. A stew made of minced mutton and potatoes, flavored with onion and seasoned very highly, cooked down to about the consistency of hash.

Kolcannon. A stew of cabbage and potatoes, with the addition of a small amount of fat salt pork and a generous amount of seasoning.

Ragout. A stew to which wine or vinegar has been added in the process of cooking.

Salmi. A stew of game.

To Boil Corned Beef

Put the corned beef on in cold water, let it come slowly to a boil, and then simmer (180° F.) for half an hour to every pound. If the meat is to be used cold it will be juicier and tenderer if it is allowed to cool in the water in which it was cooked. Home corned beef, or meat not quite so strongly salted as is that usually purchased from the butcher, may be put on in boiling water, have the

temperature then reduced, and simmered as before until cooked.

MAKING AND CLEARING SOUP STOCK

The term " soup stock " is defined by one of the standard dictionaries as " the liquor or broth prepared by boiling meat with or without vegetables, etc., so as to extract the nutritious properties, and used as a foundation for different kinds of soup."

Soup Stock

Ingredients. Meat, one or more kinds, with bone. Vegetables, such as onion, carrot, turnip, celery. Herbs, marjoram, thyme, savory, etc. Seasoning of allspice, cloves, whole pepper, bay leaf, etc. One sour apple, or an ounce of chopped ham to every two quarts of stock, helps to give a good flavor.

Proportions. For a light stock, one quart of water to each pound of meat. For a rich stock, one pint of water to one pound of meat. About one-fourth as much bone as meat, by weight. One-half to one cup of each vegetable, cut in cubes, to every two quarts of stock. One-half to one teaspoonful of each herb (dried), one-half to one teaspoonful of the spices, mixed, and one bay leaf to every two quarts of stock.

Method. Wipe the meat and cut it into small pieces. Place it in the required quantity of cold water, and let it stand for half an hour. Then apply gentle heat, and allow it to come very slowly to a boil. It should take at least an hour for a stock pot containing six quarts of water to reach the boiling point. The vegetables may then be added, together with the herbs and seasoning. These last

should be tied loosely in cheesecloth, and the whole allowed to simmer for six hours. The stock should then be strained and cooled.

TO CLEAR SOUP STOCK

Method 1. To Clear Stock with White of Egg. Remove the fat from the cold stock by skimming it carefully. If the stock is jellied, the surface of it should be wiped after skimming off the fat with a soft cloth wrung out of boiling water, so as to remove every particle of grease. Allow the white of one egg, slightly beaten, to every quart of stock. The crushed shell of the egg, for the sake of the albumin that clings to it, may also be added. The egg is mixed well with the cold stock, and the whole is heated slowly, with occasional stirring, to incorporate the egg, until the albumin begins to coagulate. It may then be allowed to boil for five minutes, and to stand, after removing from fire, for about ten minutes, so as to allow the egg to rise to the surface. It may then be strained through a piece of double damask, or through several thicknesses of cheesecloth, placed over a fine strainer. The stock is then ready for use.

Method 2. To Clear Stock with Chopped Beef. Finely chopped lean meat, one-fourth to one-half pound to each quart of stock, is used similarly to the white of egg. This method adds to the flavor of the stock, and the residue of meat, left after the stock is strained, may be used in hash, croquettes, or some other form of *réchauffé.*

Method 3. To Clear Stock by Skimming. In this method constant watchfulness and care must be employed during the time the stock is coming to a boil, and the scum that rises to the surface must be skimmed off as it rises. Even with very great care, some of this scum will

be broken into brown flakes through the stock, and these will have to be removed in the end by repeated strainings through Canton flannel.

DERIVATIVES OF STOCK

Clear Soup. Stock is seasoned with salt, flavored with lemon juice or rind, if this is relished, and served as a soup. Such a clear soup is often called consommé, or bouillon.

Bouillon. This term is applied more strictly to a clear soup made from a stock in which beef alone was used in the making.

Consommé. In its most restricted meaning this term is applied to a stock of "consummate" richness, made from beef, veal, and fowl, in which ordinary stock, or bouillon, is substituted for water in the making.

Court Bouillon. This is a stock made from highly flavored vegetables, which may be cooked in a mixture of three parts of water to one of vinegar. About a pound of the vegetables is allowed to every quart of the liquid. The stock is highly seasoned — salt, peppercorns, cloves, and any desired spices being used. Fish is sometimes boiled in a court bouillon in order to enhance the flavor. It may be used several times as a medium for the cooking of fish, improves with use, and does not readily spoil.

Glaze. This is a stock which has been boiled down to one-fourth of its volume. It is used to color and flavor gravies, to brush over the outside of meats to improve their appearance, etc.

Experiments to Aid or Confirm Inferences

I

Solubility of the Globulin of Meat

1. Digest a portion of finely minced or chopped raw meat in ordinary faucet water. Filter, and add filtrate, drop by drop, to a beaker of pure water.

2. Proceed as in 1, using a 10 per cent salt solution.

3. Proceed as in 1, using a saturated salt solution.

4. Where insoluble particles have been formed on dropping the filtrate from the meat into distilled water, test this substance for protein. This protein belongs to a class called globulins. What are some of their characteristics?

II

Preparation of Kreatin

1. Mince finely some lean beef, and steep it in water until all the soluble matter has been dissolved out.

2. Decant or filter the liquid, and heat it to boiling. Filter again after scum has formed.

3. Cautiously add a saturated solution of lead acetate, drop by drop, to the filtrate from 2, until there is no longer any precipitation. If any precipitation has taken place it should be removed by filtration.

4. Pass sulphuretted hydrogen through the liquid from 3. This will remove excess of the lead. If a slight pellicle should form on the surface during this process the liquid will have to be refiltered to remove it.

5. Evaporate the liquid from 4 over a water bath until it is of a syrupy consistency. Then set it aside in a cool

place until crystals form. These will be crystals of kreatin.

NOTE. One of the commercial extracts of meat may be used instead of chopped beef and steps 1 and 2 omitted.

TOPICS FOR STUDY OR DISCUSSION

1. The names and location of the various cuts of mutton and lamb. How these may be used. The fancy joints, *e.g.*, the crown of lamb, the saddle of mutton, etc.
2. Lamb *vs.* "yearling." Ewe *vs.* wether mutton. The best breeds of mutton. How to choose good lamb and mutton.
3. The names and location of the various cuts of veal. The feeding of prime veal, and the age at which it is used for food. How to choose good veal.
4. The causes of the toughness of meat.
5. The sapid extractives of meat and their function.
6. Vegetables, sauces, and desserts appropriate to serve with lamb, mutton, veal, with particular attention to vegetables and other foods rich in iron to supply the lack of this mineral in veal.
7. Minerals in food in organic *vs.* inorganic form.
8. Vegetarianism *vs.* mixed diet from the ethical standpoint; from the standpoint of experience of the race.
9. The inspection of meats at the slaughterhouses; the food laws relating to meat.
10. Exports and imports of meat; trade with other countries.

QUESTIONS

1. What parts of the animals are best to use for stew? Discuss the relation between exercise and tenderness.
2. Discuss the relation between the amount of extractives, or flavoring substances, in different kinds and cuts of meat and the methods usually employed in cooking the same.
3. Why does meat lose weight in boiling? What cooking process involves the greatest loss in weight? What is the proportionate loss of weight in tough and tender cuts? Account for this.

4. In browning a portion of the meat for stew, which kind would you select, the tough or the tender portion? Why?

5. What kind of meat would be appropriate for a ragout? Could this method of making stew be used to abridge the time needed for cooking?

6. Should a stew be skimmed? Should the stew pot be left uncovered? Give your reasons.

7. Criticise the definition of stock quoted from one of the standard dictionaries.

8. Compare the making of gelatine jelly with the making of soup stock.

9. What principle is involved in the first two methods given for clearing soup stock?

10. When would you add the salt in making soup stock? Why? (See page 97.)

11. In what processes of food preparation might a loss of globulin be expected?

12. Cite the possible causes for failure in the work of clearing soup stock.

13. Compare the nutritive value of a pint of soup with the nutritive value of the left-over meat.

14. Formulate two general rules for the cooking of meat, applicable in every case where flavor is to be developed and nutritive value retained.

15. Enumerate the examples of solubility, under different conditions; of insolubility; of change in flavor induced by heat — that have been apparent to you in your cooking of animal foods.

16. Why are fewer calories yielded by lamb than by mutton? by veal than by beef? by dried beef than by corned beef? (See charts, Appendix A.)

17. Trace the relation between the experiments and the practical work of this chapter.

EXERCISES

1. Make diagrams of the veal and mutton animals, making the key to the diagrams, etc., as in the case of the beef animal.

2. Make a tabular list, in parallel columns, of the substances found, respectively, in (1) raw beef; (2) broiled steak; (3) boiled corned beef; (4) soup stock before clearing; (5) soup stock after clearing; (6) meat left after making stock. Indicate in each case where any substance was lost, in part or wholly, during the process of preparation.

3. A fritadella is a dish made from highly seasoned minced meat, mixed with an equal amount of mashed potato, and sautéd on a hot pan. Or it may be pressed into a mold, and steamed or baked. Make a fritadella from the meat left over from the stock, using appropriate seasoning to make up for the loss of the extractives.

4. On what principle would you combine gelatine with meat? Illustrate by using both in the making of some dish.

5. What constituents of beef are lacking in veal? Cook veal in two ways, showing (1) how you may compensate for the lack; (2) how you can utilize to the utmost the traces of the constituents which are present.

6. The flavor of meat is developed in proportion to the degree of heat employed in cooking it. Show the degrees of this development of flavor in three methods of cooking meat.

7. Show, in the making of a palatable dish, that the connective tissue of meat can be converted into gelatine.

REFERENCES

See references for Chap. IX, with the addition of the following:

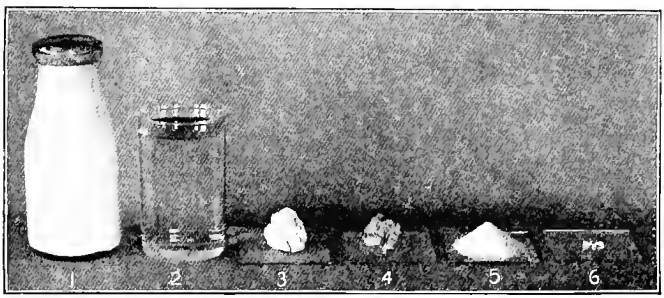
Leach. Food Inspection and Analysis.

Parloa. Kitchen Companion, for accompaniments to meats, fancy joints, etc.

Bulletin 18, U. S. Dept. of Agriculture, Div. of Veg. Phys. and Path.: The Physiological Rôle of the Mineral Nutrients. Bulletin 19, U. S. Dept. of Agriculture, Bureau of Animal Industry: The Inspection of Meats for Animal Parasites. Bulletin 66, U. S. Dept. of Agriculture, Office of Experiment Stations: the Physiological Effect of Creatin and Creatinin.

CHAPTER XII

MILK



Analysis by M. D. Chambers.

ANALYSIS OF 1 LB. OF MILK

1. 1 lb. (1 pint) of milk.
2. 14 oz. water in 1 lb. milk.
3. .5 oz. proteid in 1 lb. milk.
4. .65 oz. fat in 1 lb. milk.
5. .85 oz. carbohydrates in 1 lb. milk.
6. 1 oz. mineral salts in 1 lb. milk.

To the Student. Milk is said to be a perfect food, because it contains all that is necessary to sustain life. The young of all mammals live on it, and develop muscle and bone, teeth and skin and hair and hoof, and energy and intelligence, on this food alone. Human grown-ups, in certain physical conditions, are confined to merely this food for periods of perhaps months, and have enjoyed life and liberty, and pursued happiness — as well as their customary avocations — while restricted to this diet.

Milk contains all the food principles — protein, fat, carbohydrate, water, and minerals — in the right proportion

to nourish the young. Its bulk, in proportion to its nutritive value, makes it less suitable to adults in ordinary life than it is to children, but its usefulness and wholesomeness should insure it a place in every dietary.

In the study of milk assigned in this chapter you should try to discover the characteristics of its chief constituents, and if there is time and opportunity, to make a rough analysis of this important food, isolating its component parts and even making a rough quantitative estimate of the proportion of each that is present.

Rennet Custard, or Junket

Ingredients. Junket tablets, milk, water, sugar, flavoring.

Proportions. One junket tablet to one quart of milk. Water enough to dissolve the tablet, about one tablespoonful or less, sugar and flavoring to taste — a half-cup of sugar to a quart of milk is a good proportion.

Method. For class work, or if it should at any time be desired to abbreviate the process, a double quantity of junket tablets may be used. Hence in this recipe half of one tablet can be allowed to one cup of milk.

Dissolve the tablet in a very little water. Heat the milk until just blood-warm, dissolve the sugar in the warm milk, then stir in the dissolved junket tablet, add the flavoring, stir well, and pour the mixture into the dishes in which it is to be served. Let it stand in a warm place until it is set — it should be of the consistency of jelly — then place it on ice or in the refrigerator until chilled.

Serve with a spoonful of strawberry or other preserve on top, and pile whipped cream over this.

Make a second junket, using milk which has first been boiled and then allowed to cool to blood-warm.

Make a third junket, using freshly boiling milk.

Compare results. Does boiling the milk prevent the action of the rennet? Is the action of the rennet retarded or weakened by boiling the milk? What effect has a boiling temperature applied directly to the rennet?

NOTE. One-half cupful of milk, or less, may be allowed for each of the methods given above.

Cottage Cheese

Method 1. Proceed as for junket, omitting the sugar and flavoring. When the milk is set or jellied, break up the clot with a fork, and strain off the liquid through a jelly-bag, or a piece of cheesecloth placed over a wire strainer. Squeeze the cloth gently to get rid of the liquid, season the curd with a little salt, blend it well with a spoon, and serve with or without cream.

Save the liquid, or whey, which was strained off from the curd.

Method 2. Use sour milk; it is best when just nicely clabbered. Heat it very slowly and gently until the curd has separated. Strain as before, season, and serve. Preserve the liquid as in Method 1.

Compare both kinds of cottage cheese as to consistency and flavor. Compare the whey resulting from the two methods. Preserve the whey for future use.

Butter

Beat an ounce of thick cream with a Dover beater in a bowl until butter is formed. Separate the butter from the buttermilk, wash it thoroughly in cold water, and

form it into a little ball. Compare this with the ordinary creamery butter. What weight of butter was yielded by one ounce of cream?

Constituents of Butter. Melt the butter just made over very gentle heat, and decant the fat. Put the precipitate into a test tube, and shake it up with an equal volume of ether, to remove the remaining fat. Examine the residue. Does it resemble any substance formed from milk today? Test it for protein.

Boil the decanted butter fat. Is water present? (Froth and " sputtering " indicate the presence of water.)

Constituents of Whey. Boil down the whey from the first method of making cottage cheese, or evaporate it over a water bath. If flecks of a coagulated substance should form during the boiling they must be removed by filtration and preserved. When the liquid is nearly all evaporated set aside the remainder to evaporate at ordinary temperature. Hard crystals of impure milk sugar should be formed. Taste it, and compare with cane sugar.

Examine the substance on the filter paper. Test it for protein. What kind of protein is soluble in water and coagulated by heat?

Test another portion of the whey for the presence of lime salts by adding a solution of ammonium oxalate. A white precipitate indicates the presence of lime.

NOTE. If no coagulated flakes appear during the evaporation of the whey, the second protein in milk may be tested for by heating a portion of ordinary milk gently until a scum forms on the surface.

MILK SOUPS

Milk soups, called by courtesy cream soups, are usually made on the basis of a thin white sauce. This is the

same, as to ingredients and method of making, as the medium white sauce given in Chapter II, (page 9), except that only one tablespoonful of butter and one of flour are used for every cup of milk or other liquid.

There are two classes of these soups, one in which small pieces of the vegetable, already cooked, are added to the required amount of white sauce, as in cream of asparagus soup, or celery soup; the other in which sifted vegetable pulp is used, as in corn soup or potato soup. The distinction, however, is more or less arbitrary, since asparagus soup is sometimes made of the sifted pulp, and corn of the canned corn without being sifted.

The general rule for milk soups is to add to the white sauce — which must have extra seasoning — the desired amount of the vegetable or vegetable pulp, and cook the two together until the mixture boils. From one-half to an equal amount of vegetable is the proportion usually added to the sauce, this being one of the cases where there is wide scope for individual taste. Much will depend, of course, on the flavor of the vegetable — whether or not this is pronounced.

A cream tomato soup, on account of the tendency of the tomato acid to curdle the milk, is often made after adding a little baking soda, about one-quarter teaspoon to each cup, to the sifted tomato pulp. Since the flavor of the tomato is altered by the addition of the soda, and since the soda is not always desirable from the standpoint of digestion, the following method of making this soup may be used, and if carefully followed there will be no danger of curdling. Moreover, the addition of alkali in cooking vegetables or fruits has a bad effect on the vitamines. See Chap. XXI.

Cream Tomato Soup; sometimes called Mock Bisque Soup

Ingredients

2 tablespoonfuls flour.
2 tablespoonfuls butter.
Seasoning, salt and pepper.
2 cups sifted tomato pulp.
2 cups milk.
2 teaspoonfuls sugar.

Method. Melt the butter and blend with it the flour and seasoning. Add the tomato pulp, and stir until the mixture has boiled for one minute. Add the milk, keep stirring until the mixture ceases to be "ropy," let it come to a boil, and serve.

Milk Toast

Bread for toast should be cut neither too thin not too thick; a half-inch thick is a good proportion. An ordinary brick-shaped loaf should yield sixteen slices.

The slices can be toasted on the rack of the broiling oven of the gas range, or in any other preferred way. They should not be approached too closely to the source of heat at first, so that they may be sufficiently dried out by evaporation to insure the right amount of crispness — good judgment must be exercised here, for this dish, though very simple, is only in perfection when made in just the right way. The toast when finished should be crisp, but not too brittle, and should be a uniform golden brown on both sides. Each slice should be then dipped — for an instant merely — into very hot salted water, just "off" the boil. The process of dipping must be so rapid, and the toast must be at so exactly the right stage of crispness, that the slices will not be soggy. They are then placed on a hot platter, and while still fresh and steaming a thin white sauce is poured over them. The

pepper should be omitted from the seasoning of this sauce.

The sauce should be prepared before the slices are toasted, since the success of the dish depends so largely on the quickness of the last steps, the toast being dipped before the fresh, " crispy " odor has vanished, and the sauce being poured over the slices while the first of the steam is rising. Only one or two slices should be prepared by a beginner. A half-cupful of sauce will be sufficient for two slices.

VARIATIONS ON MILK TOAST

Egg Toast. This is made by adding to every cup of the white sauce for a plain milk toast one chopped, hard-boiled egg.

Fruit Toasts. Peach, apple, strawberry, and other toasts are made by substituting hot, stewed fruit for the white sauce used in the ordinary milk toast. These form very acceptable luncheon dishes.

Tomato Toast. This is made similarly to the fruit toast, and can be served as a vegetable or as an entrée. A little cheese, grated over the top, adds to its savoriness.

MILK PUDDINGS

Bread and Butter Pudding

Ingredients.

½ of 1 stale loaf.
2 to 3 cupfuls rich milk.
½ cupful sugar.
1 to 2 eggs.
Butter, from ⅛ to ¼ pound.
Raisins, preserves, or jelly.

Method. Cut the bread in one-half inch slices, and spread each slice liberally with butter. Fit the slices

into a baking dish with the buttered side down, and scatter raisins between the layers.

Dissolve the sugar in the milk, which may or may not be heated, and stir into the mixture the well-beaten yolks of the eggs. Pour this over the bread in the baking dish, cover, and bake for 20 m.

Take off the cover and allow the bread to brown. Then spread a layer of jelly or preserve on the top — quince is the best — pile over this a meringue made from the whites of the eggs (see Chapter V, page 33), and replace in the oven until the meringue is firm and very delicately browned.

Chocolate Bread Pudding

The ingredients and quantities are practically the same as for Bread and Butter Pudding, except that the butter is omitted and two ounces of grated chocolate are dissolved and added to the milk. The bread, instead of being sliced, is grated, and if very stale an extra cup of milk may be needed.

In both of these puddings the fruit and jelly may be omitted if a plainer pudding is desired.

NOTE. According to the results of investigations by the Washington Department of Nutrition, Bulletin 53, Office of Experiment Stations, bread and milk, when taken in combination, are more completely digested than when either one is eaten by itself. The foregoing recipes for milk toast and puddings suggest pleasing combinations of these foods.

STUDY OF THE PHYSICAL AND OTHER PROPERTIES OF MILK

1. Mount a drop of milk on a slide under a cover glass, and examine it under the microscope (625 diameters).

2. Ascertain the weight of a given quantity of milk as compared with the weight of a similar quantity of water.

3. Test the reaction of milk to litmus, using strips of both red and blue litmus paper. It would be well, if possible, to test two samples of milk, one freshly drawn, one several hours old.

4. Ascertain the boiling point of milk.

5. Test whole milk with the lactometer; test skimmed milk; test cream. Compare the specific gravity of these with that of water.

6. Apply Babcock's fat test to milk, if the apparatus is available.

STUDY OF CHEESE IN COOKING

Welsh Rabbit

Ingredients. Cheese, sliced or grated; milk, seasoning of salt and pepper, mustard, paprika, onion juice, etc. Egg and butter are sometimes used.

Proportions. One-eighth as much milk as grated cheese, or one-fourth as much milk may be used if egg is added. Not more than one teaspoon of butter to a cup of cheese. Seasoning to taste, about twice as much mustard as salt will be sufficient, unless the flavor of mustard is greatly liked.

Method. Melt the butter in the saucepan. Add the milk and the grated cheese, and stir until the cheese is just melted. Add the seasoning, and the beaten egg, if this is used, and stir the mixture until it is slightly thickened, but not stringy. Pour at once on toasted crackers or pieces of toast and serve immediately.

Make a second Welsh rabbit, using the same proportions and ingredients as for the first, but adding with the seasoning one-eighth of a teaspoonful of bicarbonate of soda or potash.

Compare the two as to consistency.

A simple form of Welsh rabbit, and one that will not readily curdle or string, is made on the basis of a thick white sauce, as follows. The thick white sauce is made similarly to the medium white sauce (see Chapter II, page 9), except that the proportions call for four tablespoonfuls of flour and four of butter to one cupful of liquid. Any extra seasoning that may be desired for the rabbit is added, and when the sauce is cooked, from three to four times its volume of grated or thinly sliced cheese is stirred in, and the whole is cooked until it is of the proper consistency.

VARIATIONS ON THE SIMPLER FORMS OF WELSH RABBIT

Olive Rabbit. Chopped olives or pimolas may be stirred in the last thing. In this case the brine from the olives should be substituted for milk in making the rabbit.

Oyster Rabbit. Parboiled oysters are added to the rabbit when it is nearly ready to be removed from the fire. Oyster liquor is substituted for the milk.

Yorkshire Rabbit. This has toasted bacon, cut in little bits, added to the rabbit the last thing. Or a strip of the bacon may be placed on the rabbit just before serving.

Golden Buck. This is a rabbit with a poached egg placed on the top.

Scotch Woodcock. The toast or crackers on which the rabbit is served are first spread with anchovy paste, and chopped, hard-boiled eggs are stirred into the rabbit before it is poured on these.

NOTE. An under-ripe cheese will not make a good rabbit, for it will separate and oil. This will also happen if a filled cheese is used.

TOPICS FOR STUDY OR DISCUSSION

1. Methods of preserving milk; condensed and evaporated milk, dessicated milk, and milk powders.
2. Derivatives of milk, malted milk, etc. The souring of milk. The theory of Metchnikoff.
3. The market prices of milk and cream of different quality. Food laws relating to milk, butter, cream, and cheese. Certified milk. The use of viscogen in cream.
4. The best dairy breeds of cattle for yield of milk, for cream, for cheese-making.
5. Varieties of butter, pasteurized, unsalted, creamery, dairy, etc. Renovated or process butter. Butter *vs.* butter fat. Oleomargarine.
6. The different classes of cheese, skim-milk, whole milk, milk and cream, cream.
7. Comparison of the various kinds of cheese, *e.g.*, Edam, Gouda, Gruyere, Parmesan, Cheddar, Gorgonzola, Roquefort, Stilton, etc.
8. American cheese and its manufacture.
9. Food laws relating to milk, butter, cream, and cheese. Oleomargarine, and the laws relating to its manufacture and sale.
10. Milk from other animals than the cow.
11. Diseases conveyed by milk. Sterilization and pasteurization of milk.
12. Milk as a food for the young; as a food for adults. The constituents of milk considered in detail.

QUESTIONS

1. Compare the composition of cream and milk (see charts). Compare the proportions here with the proportions you discovered to hold good in the case of some other food. (See Question 10, Chapter X, page 88.)
2. What constituents in milk were isolated in the work of this chapter?
3. Compare the whipping of cream with the frothing of milk when it boils.

4. Compare two methods of making Welsh rabbit with the two methods of making the dish where potatoes are combined with cheese in Chapter II, pages 9 and 10.

5. Compare the making of the cream tomato soup with the making of another soup made on a milk basis, given in a preceding lesson.

6. Should the scale of the lactometer read up or down? Why? Show why milk that has been skimmed and then has water added might respond to the standard specific gravity test with the lactometer.

7. Discuss butter fat *vs.* butter as estimated by Babcock's test.

8. Account for the relative cost of cream and of butter.

9. What is the nutritive ratio of milk? What bearing has this on the suitability of milk as a food for the young?

10. Discuss the changes brought about by the boiling of milk.

11. Is milk to be considered as a beverage or as a solid food? What bearing has this on our use of milk as a beverage, whether it should be sipped slowly or swallowed at a draught? What bearing has it on our combination of milk with other foods?

12. Compare the three white sauces, and make a list of the dishes which are based on each. Keep this list on a separate page, so that you may add to it from time to time

EXERCISES

1. Devise a method of pasteurizing milk. Consult your instructor as to its practicality, and then carry out your process, verifying its results by a comparison of the behavior of raw milk with your pasteurized milk when both are applied to some culture medium.

2. Show how a thin cream may be stiffened with gelatine and beaten to a froth.

3. Combine milk with sago, arrowroot, or some other farinaceous food, with appropriate flavoring, and addition of other substances so as to make a dish which shall have an approximately correct nutrient ratio for adults.

SALAD OF COTTAGE CHEESE, LETTUCE, AND TOMATO

4. Make a cheese soufflé on the basis of one-half cupful of a thick white sauce and an equal quantity of cheese.

5. Devise attractive modes of serving cheese in combination with green vegetables such as lettuce, cress, etc., which are rich in potash salts.

6. Make a coffee, cocoa, or chocolate junket.

7. Mocha icing for cakes, etc., is made of butter, thoroughly washed in cold water until it is of a waxy consistency, and then mixed with powdered sugar and flavored with very strong coffee. It should be a rich brown color, and have a strong flavor of coffee. Make a portion on the basis of one-quarter cupful of butter.

References

Bailey. Sanitary and Applied Chemistry, Chap. XXI.
Church. Foods, Part III.
Conn. Bacteria, Yeasts, and Molds in the Home, see Index.
Jordan. The Principles of Human Nutrition, Chap. XVII.
Hutchison. Food and Dietetics, Chaps. VII, VIII, and IX.
Lassar-Cohn. Chemistry in Daily Life, Lecture III and IV.
Lusk. Science of Nutrition, Chaps. IX and X.
Russell. Dairy Bacteriology.
Snyder. Human Foods, Chap. VII.
Thompson. Practical Dietetics, Milk.
Wiley. Foods and Food Adulterants, Part IV.

Farmers' Bulletins, U. S. Dept. of Agriculture: No. 9, The Fermentations of Milk; 29, The Souring of Milk; 42, Facts About Milk; 63, Care of Milk on the Farm; 74, Milk as Food, and 363, The Use of Milk as Food.

Also, Farmers' Bulletin 131: Household Tests for the Detection of Oleomargarine and Renovated Butter; and Bulletin 61, U. S. Dept. of Agriculture, Bureau of Animal Industry: The Relation of Bacteria to the Flavor of Cheddar Cheese.

Sherman, see Index, ed. 1920.

CHAPTER XIII

FATS

To the Student. The fats most commonly used in the diet are cream, butter, and olive oil. Fatty foods which are so rich in this substance as almost to come under the heading of pure fats are bacon, pork, many varieties of nuts, some of the rich cream cheeses, the yolks of eggs, chocolate, etc. Then there are the fats which are used as a medium for conveying heat, as in deep fat frying, and the fats which are used as shortening.

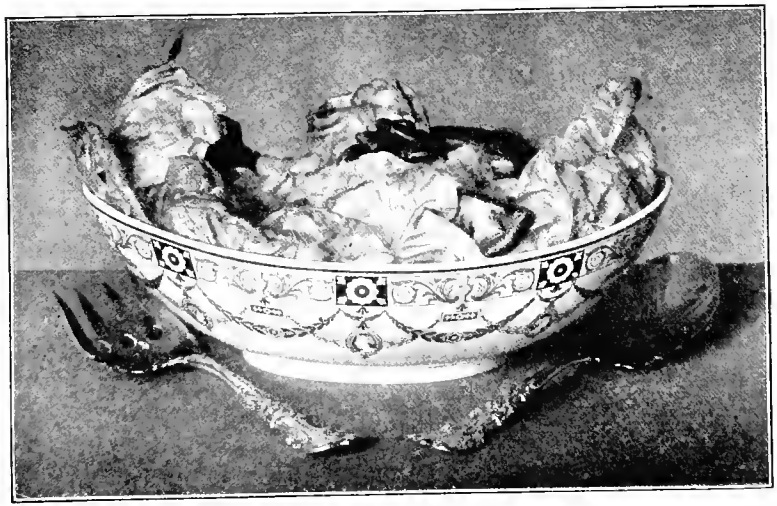
Since fat when overcooked is chemically changed to such an extent as to become very unwholesome — even poisonous — it is quite essential to know how to use fat so that we may gain rather than lose in health and vigor from employing it freely in our daily meals.

STUDY OF FAT IN COOKING SALAD DRESSINGS, ETC.

French Dressing

Ingredients and Proportions. One part of vinegar to three of oil; about one-half teaspoonful of salt and one-quarter teaspoonful of pepper to every three tablespoonfuls of oil.

Method. Mix the seasoning with the oil, then add the vinegar slowly, stirring it well in, so that the dressing, when finished, shall have the appearance of a grayish,



BOWL OF GREEN SALAD

slightly thickened emulsion. In a well-made dressing the taste of both the oil and the vinegar should be lost in the blending of both.

This dressing is appropriate for all green salads.

Variations. The flavored vinegars, such as tarragon or chervil, may be used if desired. Lemon juice may be substituted for vinegar, and this is by some considered wholesomer. A dash of paprika, even a few grains of cayenne, or a spoonful of onion juice, will be relished by many persons.

Marinade [1]

This is a mixture in which the proportions of oil and vinegar for a French dressing are reversed, so that one part of oil to three of vinegar are used. A flavored marinade has added to it the seasonings used in the regular dressing. This is used to prepare either over-dry or flavorless substances for a salad. For instance, fish, potatoes, the white meat of chicken, etc., are cut up and allowed to stand in the marinade for a couple of hours before making the salad, and a certain piquancy of flavor is thus gained. Only a small amount of marinade should be used for this purpose — not more than will be absorbed by the food to be marinated. Such a salad is usually served with a mayonnaise dressing.

An unflavored marinade is composed of vinegar and oil without other seasoning. A tough steak may be immersed in this for several hours, or overnight, to make it tender, then drained, wiped, and broiled. Such a marinade can be made in large quantity, and used over and over again.

[1] Note that the noun is *marinade*, while the verb is *marinate*, so that you could say, "I will make a marinade to marinate the fish."

Mayonnaise

Ingredients and Proportions.

Yolk 1 egg.
From 1 to 2 cupfuls oil.
1 to 2 tablespoonfuls vinegar, or half this quantity lemon juice.
½ to 1 teaspoonful salt.
A dash cayenne.
A teaspoonful each powdered sugar and dry mustard are optional.

Method. The oil and the egg yolk should be chilled before beginning the work, or if the weather is very warm the mixing dish should be stood in a bowl of cracked ice. Stir the seasoning into the egg yolk with a fork, then add one drop of oil, and stir until this is thoroughly incorporated before adding another drop. Proceed to add the oil, a drop at a time, until about a teaspoonful has been used; then it may be added in larger quantity, or a thin stream may be continuously poured from a utensil constructed for this purpose. When the dressing grows too thick to be worked it should be carefully thinned out by the addition of a few drops of the vinegar, and the oil and vinegar should be thus alternated until the desired amount of oil has been added. The yolk of one egg can be made to take up a pint of oil, though only one-half this quantity is generally allowed.

The mayonnaise, when completed, should be smooth and glossy in appearance, and in consistency it should hang from the fork but not drop.

An expert can use many liberties in making this dressing, but in inexperienced hands, even when great care is used, the mixture will often separate slightly or curdle. The best remedy is then to begin all over, using the curdled dressing instead of oil to add to another egg yolk.

This dressing is appropriate for the heavier salads, such as those of meat, fish, the more fleshy vegetables, etc.

Variations. The yolk of one hard-boiled egg can be blended with the yolk of one raw egg as a foundation for the oil, and the danger of curdling will be minimized by this method.

For a fruit salad enough of powdered sugar is used to sweeten the mixture to taste, from one to two tablespoonfuls to a cupful of oil.

A red mayonnaise can be made with beet vinegar, or pounded lobster coral can be added to the dressing when finished.

For a green mayonnaise the juice from pounded raw spinach should be heated very slightly until green flecks can be separated; these are added to the dressing. If the spinach juice is overheated the color will be changed.

A white mayonnaise has for its foundation a light-colored yolk of egg, and lemon juice, which has a bleaching effect, is substituted for vinegar. Or whipped cream, or stiffly beaten white of egg, can be added to an ordinary mayonnaise just before serving.

A mayonnaise tartare, sometimes called sauce tartare, is a plain mayonnaise with chopped pickles of any desired varieties added at serving time.

NOTE. A well-made mayonnaise will keep good for several weeks if poured into small jars or glasses, covered, and stored in the refrigerator.

Mock Mayonnaise No. 1

Ingredients and Proportions.

3 eggs.
½ tablespoonful lemon juice to each egg.
1 teaspoonful butter to each egg.
Seasoning, salt, pepper, celery seed, paprika, or mustard and sugar if desired.

Method. Beat the eggs very stiff. Add seasoning and lemon juice, and beat again. Cook over hot water or in a double boiler, beating or stirring until the mixture has

thickened. Remove from fire, pour into a dish set in cold water, add the butter, and stir until the dressing is cool.

Mock Mayonnaise No. 2, or Cooked Dressing. See Dressing for Hot Slaw, Chapter X, page 85.

Cream Dressing

Ingredients and Proportions. Thick cream, and one-fourth as much vinegar as cream. Seasoning of salt and pepper, also paprika, celery salt, sugar, or other condiments if desired.

Method. Whip the cream until stiff, add the seasoning, lastly the vinegar, a little at a time, beating it well in.

Sour Cream Dressing

Ingredients and Proportions. Thick cream, slightly soured, and one-eighth as much vinegar as cream. Seasoning as for cream dressing. One or two hard-boiled yolks of eggs, put through a ricer, may be added to each cupful of the cream.

Method. Proceed as for cream dressing.

DIRECTIONS FOR PREPARING SALADS

Green vegetables, that is, fresh, uncooked vegetables such as celery, cress, lettuce, tomato, etc., must be cool and crisp. To bring about this condition they should be thoroughly washed, allowed to stand in fresh, cold water until all signs of wilting or softening have disappeared, then wrapped in a damp towel and placed in the refrigerator until needed. The leaf vegetables in particular, such as lettuce, cabbage, romaine, or endive, seem to retain their crispness better if wrapped in a damp towel than if allowed to stand in water, or if placed on a dish in the refrigerator.

Fruits, such as apples and oranges, should be chilled,

but not pared or sliced until the last thing. Grapes, cherries, etc., should be seeded or pitted.

Cooked foods, such as potatoes, beets, chicken, fish, etc., may be sliced or cut in cubes and set away until serving time.

The dressing, with the exception of a marinade, should not be mixed with any green salad until just before it is brought to the table, since the vinegar will cause fresh vegetables to wilt.

In the combination of the various vegetables, fruits, nuts, with one another or with meats or fish, there is unbounded scope for individual taste, as there is also in the tasteful arrangement and decoration of every salad. The illustrations on pages 113 and 116 will be perhaps suggestive of new methods of combination or arrangement, but everyone should be able to express her own tastes and her own sense of the artistic in the construction of some novel salad which shall be "good for food, and pleasant to the eyes."

DEEP FAT FRYING

Frying is a method of cooking food by immersing it in very hot fat. Properly fried food should not be unwholesome for ordinarily healthy persons. The overheating of the fat, to the point when chemical decomposition takes place, and when the irritating or poisonous substances are formed which were mentioned at the beginning of this chapter, is the most important thing to avoid in this method of cooking. The beginning of this decomposition is usually indicated by the appearance of a delicate blue smoke or vapor, which rises first from the sides of the kettle, later from the whole surface of the fat. If the articles to be fried are plunged into the fat at the first

appearance of this vapor the temperature will be immediately lowered by the introduction of the cold food, and no great harm will be done. This is why the best cookery books direct that the food shall be immersed in the fat when it first begins slightly to smoke at the sides of the kettle. This test, however, is not the best for a novice to depend on. A more excellent way is to use a thermometer to test the temperature of the fat, first at its decomposition point, indicated by the blue vapor, next at the temperature proper for frying. If the decomposition point of the fat should be lower than 350–400° F., which is the temperature commonly employed in frying, such a fat is unfit to use for a cooking medium.

EXPERIMENTS IN HEATING FAT

In very small agate saucepans, or any other convenient utensils, melt and gradually heat to smoking point sufficient quantities of butter, lard, beef suet, olive oil or refined cottonseed oil, and one or two of the commercial compound shortenings, so that the bulb of a thermometer registering about 600° F. or its equivalent on the Centigrade or other scale may be inserted in the fat as it heats.

Note in each case: (1) the color of a one-inch cube of bread when dropped into the fat on its reaching a temperature of 350° F. and allowed to remain in it for exactly 1 m. (2) The color of a similar cube of bread when cooked for forty seconds when the fat has reached 400° F. (3) The temperature of each fat when the warning blue vapor appears at the sides of the saucepan.

Since the correct temperature for frying a cooked mixture is 400° F., and that for an uncooked mixture is 350° F., you will now be able to judge which kind of fat is the best to use as a cooking medium.

FRYING OF A COOKED MIXTURE

Croquettes

Make one-half cupful of thick white sauce (see Chapter XII, page 110). Mix with this twice its volume of chopped meat or fish, chill (for convenience in handling), and form into cylinders. Roll these lightly in finely sifted crumbs (this is for the purpose of absorbing any moisture on the outside), then dip into a mixture of beaten egg and water, (one tablespoonful of water to each egg), and roll once more in the sifted crumbs. The water is added to the egg to keep it from forming a strong froth, and care should be taken, for the same reason, not to beat the egg too much, since the froth-bubbles prevent the formation of a uniform coating or envelope of the albumen, and this coating, hardening immediately as it does in the hot fat, keeps the croquettes from being greasy.

Loose crumbs should be gently shaken off, and the croquettes placed in a frying basket and lowered into the fat. They should be cooked in 1 m.

Drain on absorbent paper, and keep hot until ready to serve.

FRYING OF AN UNCOOKED MIXTURE

Banana Fritters

Sift one-half cupful of flour with a small pinch (one-eighth teaspoonful) of salt and one teaspoonful of baking powder. Stir this mixture into one-quarter cupful of liquid, composed of equal parts of milk and beaten egg. (One beaten egg mixed with one-quarter cupful of milk will be sufficient for two students.)

Into the batter thus made stir from once to twice its volume of pared and sliced bananas, and drop

by tablespoonfuls into hot fat at the right temperature for uncooked mixtures. Cook for 3 m., or until the fritters rise to the surface, turn over, and are nicely browned.

Lift out with a skimmer, drain, dust over with powdered sugar, and serve with or without a simple sauce.

LEMON SAUCE

To Serve with Banana Fritters

Ingredients. Lemon juice, cornstarch, sugar, water, butter.

Proportions. Four times as much sugar as lemon juice; four times as much water as sugar. One tablespoonful of cornstarch and one tablespoonful of butter to every cup of water.

Method. Heat the water. Mix the sugar thoroughly with the cornstarch, and stir into the hot or boiling water. If the mixing of the sugar and cornstarch has been thorough, and if the water is kept stirred while these are being added, there will be no danger of lumping. Allow to boil for a minute or less, stirring all the time, then remove from the fire, stir in the butter, let cool a little, and add the lemon juice.

Make another portion of this sauce by cooking the lemon juice in with the other ingredients, and see what will happen.

Almond Butter

Pour boiling water over shelled almonds, and let them stand in this for two or three minutes. Drain, put into cold water for an instant, and then rub off the skins. Stand the blanched nuts in a warm place until dry, grind them finely in a food chopper, season very slightly with

salt, and use as you would peanut butter for sandwiches, etc.

(See charts for richness of almonds in fat. This fat is said to be easier digested than the fat of any other nuts, with the exception of the fat of pecans.)

Broiled Bacon

Method 1. Cut off the rind, and cut the bacon into very thin, delicate slices. Cook these in a hot pan, turning when the slices become transparent, and removing as soon as well curled. Drain off the fat immediately, place the cooked bacon slices on absorbent paper, and serve either as a breakfast dish or as a garnish for omelet, steak, etc.

Method 2. Place the bacon slices in an oyster broiler over a dripping pan in a very hot oven, and cook until transparent and beginning to brown at the edges. Serve as before.

Compare the flavor of the two. Which of the principles of cooking is illustrated here?

Deviled Marrow Bones

Bones from the shin (the fore leg), or the shank (the hind leg), of beef should be cut into pieces from one to three inches long and scraped clean. Seal the ends with a paste made of flour and water in the proportion of four to one, tie securely in cheesecloth, and boil for 15 m. for the shorter, 25–30 m. for the longer bones. Remove the paste, season with salt and cayenne, and serve the smaller pieces on toast, the larger neatly wrapped in small folded doilies, and garnished with parsley or cress.

NOTE. Marrow is a very easily digested and wholesome form of fat, and served in this way is often greatly relished as a supper dish. The marrow from the shank is thought to be firmer and less oily than that from the shin.

Experiments to Aid or Confirm Inferences

I

Emulsification of Fat

1. Shake up a small amount of olive or cod-liver oil or cottonseed oil in a test tube with a few drops of a solution of sodium hydroxide or carbonate of soda. Does the whitish substance which results remind you of a food you have recently studied? Examine a drop of this whitish mass under the microscope.

2. Shake up as before a small amount of oil with a little egg albumin dissolved in water. Examine under the microscope as before.

II

Solubility of Fat

1. Shake up small portions of fat in a test tube with the following, respectively: Water, alcohol (both cold and hot), turpentine, ether. Determine which are solvents of fat, and to what extent.

III

Decomposition of Fat

1. Heat a little oil or other fat in a test tube until it turns brown and dense brown fumes are given off. Note the irritating effect of these fumes. Continue heating until no further change takes place.

2. Heat a little glycerine until similar dense brown fumes are given off.

NOTE. Only exceedingly small portions of above should be used in the last experiments, to avoid excess of the disagreeable fumes.

TOPICS FOR STUDY OR DISCUSSION

1. The physical structure of fatty or adipose tissue.
2. The chemical composition of fat. The principal fatty acids and how their predominance in the common fatty foods affects the solidity, the melting point, etc., of these foods.
3. The value of fat as food, its digestion and assimilation. The amount required in health. Its use in disease.
4. Fat as a protein sparer; how it compares with the carbohydrates, with gelatine, as a proteid sparer. Nations and races that make abundant use of fat in the diet.
5. The difference between the fats and the hydrocarbons. The difference between the fixed and the volatile oils.
6. Industries which deal with fats; the lard-making and fat-rendering industry; the soap manufactories; the manufacture of olive oil, of cottonseed oil, etc.
7. Food laws which relate to various fats.
8. The value of salads in the diet. The elements in salads that are nutritious, or tissue building; the elements that are wholesome, appetizing, purifying to the system by the action of vegetable acids or salts, etc.
9. National customs with regard to the use of salads.
10. Conditions under which aconitic and acrylic acids are formed during cooking processes.

NOTE. Much that is new, and that has an important bearing on the fats, is now being brought out by organic chemistry. Advanced students will be interested to study the later theories of emulsification, colloidal solution, hydrolysis, and saponification if they are qualified by previous training to pursue the subject. Very important problems will be found to be involved in trying to understand what kind of change is brought about in the mixing of even such a simple thing as a French dressing — not to speak of a mayonnaise.

QUESTIONS

1. Discuss the costliness of some of the fatty foods. Name some of the less expensive fats, and suggest methods of making them palatable.
2. What foods are especially deficient in fats?

3. Name some foods rich in both fat and protein.
4. Name some foods rich in fat and carbohydrate.
5. In what diseases is fat thought to be especially beneficial? In what cases should it be sparingly used?
6. When, broadly speaking, may fat be preferable to carbohydrate, and when may carbohydrate be preferable to fat, as a source of energy? Consider, in this answer, various occupations, factory workers, sempstresses, farmers, lumbermen, tailors, etc.
7. Which fatty foods are rich in stearin? which in olein? What is peculiar about butter as a fatty food? What happens when butter or other fats become rancid?
8. Why, in making a white sauce, should you be very careful merely to soften the butter, and not to overcook it, preparatory to blending with it the other ingredients?
9. Discuss oleomargarine *vs.* butter for table use; for use in cooking.
10. Ammonia is found to be a by-product of the lard-rendering works. Try to account for its formation under the conditions of the manufacture of lard.
11. Similarly account for the production of glycerine as a by-product of the soap factory.
12. Trace, so far as you can, the relation between the experiments and the practical work outlined in this chapter.
13. If you dropped grease on your apron or dress, how might you best remove it? Name some other practical applications in the work of the home of your knowledge regarding the solvents of fat.
14. Enumerate the principles of the preparation of fats for food that you have learned in using the recipes in this chapter.
15. What principle has been reviewed in this chapter? What new principle has been learned in the making of the lemon sauce?

EXERCISES

1. Nutted cream is a rich dessert made of thick cream, sweetened, flavored, mixed with chopped almonds or pecans, then chilled, molded, sprinkled with very finely

chopped nuts on being turned out of the mold, and served with a fruit sauce. A small amount of gelatine will be needed to stiffen the mold. Make a nutted cream on the basis of one cupful of cream.

2. A suet pudding is made of equal parts of finely chopped suet, molasses, and milk, with three times as much flour as suet. Salt, one-fourth teaspoonful to each cupful of flour, and baking powder, from one to two teaspoonfuls to a cupful of flour, are added. Either nutmeg, or other ground spice, and dried fruit make a very welcome addition. Make a suet pudding on the basis of one-half cupful of flour. The pudding may be steamed in a well-greased mold, or tied in a floured cloth and cooked in boiling water.

3. "Scrapple" is a dish made of corn-meal mush, with salt pork, previously cooked and chopped, stirred into it. The mixture may be molded in bread tins, and when cold can be sliced and fried. Make a small mold of scrapple.

References

Bailey. Sanitary and Applied Chemistry, Chap. XVIII.
Chittenden. Physiological Economy in Nutrition, Chaps. I, II, III.
Jordan. The Principles of Human Nutrition, Chaps. IV, V, VII.
Hutchison. Food and Dietetics, see Index.
Lassar-Cohn. Chemistry in Daily Life, Lectures IV and IX.
Lusk. The Science of Nutrition, Chap. VII.
Sherman. Chemistry of Food and Nutrition, see Index.
Snyder. Human Foods, Chap. I.
Thompson. Practical Dietetics, see Index.
Wiley. Foods and Food Adulterants, see Index.
Any text on Organic Chemistry for aconitic and acrylic acids.

CHAPTER XIV

CEREALS AND OTHER STARCHY FOODS

To the Student. From the work of the preceding chapters you have learned that some foods are made very much more appetizing by cooking, from the development of flavor; that some foods are rendered more and some are rendered less digestible by cooking processes, so that we often sacrifice wholesomeness for the sake of deliciousness; and that all foods are sterilized by the application of heat. In cooking the cereals it is safe to assume that only the best results may be expected, for the flavor of the grains, though slight, will be developed, the digestibility will be increased, and sterilization will be insured. But of these three results of cooking the most essential as regards the cereals, that is, the digestibility, is almost wholly dependent on the cooking processes. Hence in the preparation of these grains we shall aim at this result alone, and the other two will be found to take care of themselves.

Since a double boiler, or its equivalent in some other form of utensil, is commonly used in the cooking of cereals and other foods, it would be interesting for you to devise a means of ascertaining the temperature of the water that is in the inside part of a double boiler when the water in the outside part is boiling. One or more girls in the class

might demonstrate this experiment to the others. Different styles of double boilers should be used, holding different amounts of water in the outside compartment; double boilers having kettles of different material, agateware, aluminum, etc., should be experimented with, and the effect of prolonged cooking on the temperature of the contents of the inner kettle should also be ascertained.

GENERAL RULES FOR THE COOKERY OF CEREALS

Ingredients. Water, salt, cereal.

Proportions. From one-half to one teaspoonful of salt for every cup of water used is a good proportion of this ingredient.

The proportions of cereal to water vary according to the kind of cereal used, the method of manufacture, and the consistency preferred by the cook. The somewhat arbitrary terms "gruel," "mush," and "porridge" have been applied to varying degrees of thickness, the gruel being a watery, almost fluid mixture, the mush a much thicker preparation, and the porridge the stiffest of the three. Four times as much water, by weight, as cereal is a good working proportion, but one that must be modified by the conditions just mentioned, particularly by that of the taste of the individual.

Method. Add the salt to the water, and boil the mixture in the inside part of a double boiler. Add the dry cereal slowly to the boiling water, stirring meanwhile to increase the agitation of the water. Let it boil for from three to five minutes, stirring only occasionally, for prolonged stirring during the cooking process is apt to make the cereal waxy. Put on the cover, and place the kettle in the outside part of the double boiler, which should be filled one-third full with boiling water. Cook, closely

covered, for the length of time required, and keep up the quantity of water in the outside boiler if this should boil away.

Cereal cooked in a fireless cooker will, of course, need no further attention after the compartment is covered.

NOTE. Corn meal, and perhaps one or two other cereals of similar texture, should be mixed with an equal volume of cold water before being stirred into the boiling water, to avoid lumping. The volume of cold water used should be allowed for in measuring the proportion of water to cereal.

STUDY OF CEREAL IN COOKING

Method 1. To one cupful of rapidly boiling salted water add two ounces of any of the quick-cooking breakfast cereals. Boil for 3 m., cover, place in double boiler, and cook for one hour.

Method 2. Put on the cereal in cold, salted water, let it come to a boil, allow to boil for 3 m., and proceed as before.

Method 3. Cook the same amount of cereal in the manner and for the time prescribed in the directions on the box.

Compare the three, as to taste and consistency, and frame, as a result of your experiments, the rule regarding the proportion of water to cereal that you think most appropriate for this particular variety. Remember, however, that great exactness is impossible, since the composition of the same cereal will vary from year to year, according to soil, season, and other factors.

Method 4. Cook for from six to ten hours a similar proportion of cereal and water to the proportion used in Methods 1 and 2, but a much larger quantity should be prepared, lest the small amount should dry out too much during the prolonged cooking process. The cereal in this case might be cooked at home by some member

of the class, or the process started earlier in the day by some student who has time.

Method 5. Divide the cereal cooked by the first, second, or third method into three parts — A, B, and C. To A, previously cooled to from 100° to 150° F., add one teaspoonful of dry malt flour. Mix, and allow to stand for 5 m. Keep B at boiling point, and add to it a similar quantity of the malt flour, cooking the mixture for 5 m. Let C remain for a control test. Compare all three as to taste and consistency.

NOTE. Malt flour can be obtained at any of the manufactories of malted breakfast foods, or it may be made by grinding up some barley or other grain that has been allowed to sprout in a shallow dish of water until the young shoots are about as long as the grain.

ACCOMPANIMENTS TO CEREALS

Dates, or any other dried fruit, chopped and lightly stirred in a few minutes before removing the cereal from the fire, make a pleasing variety. Or the cooked cereal may be served with baked apple or apple sauce. Or a spoonful of fig marmalade, made by pressing steamed figs through a colander, tastes good with rice, or cereals of undecided flavor.

Cream is a logical accompaniment to the breakfast cereal, since it supplies the fat in which most of the grains are deficient.

Boiled Macaroni

Break some sticks of macaroni into one-inch pieces until you have from one-quarter to one-half a cupful. Cook in a large quantity of boiling, salted water until done. The time for cooking depends on both the method of manufacture and the age of the macaroni, and varies from 20 to 40 m. When done, the strips, if cut across, should not show a thin line of uncooked paste in the center.

The macaroni should be drained when cooked, and some persons like to hold the colander for a moment under a stream of cold water from the faucet, so as to prevent the strips from clinging to one another.

The boiled macaroni may be served with a white sauce, or may be combined with tomato like cabbage (see Chapter III, page 16), or with cheese like potato (see Chapter II, page 9), or it may be mixed with apple sauce.

SPONGE PUDDINGS

Lemon Sponge

Ingredients. One cup of water, a pinch (one-eighth teaspoonful) of salt, four tablespoonfuls of sugar, two of lemon juice, and one and one-half of cornstarch. The whites of one or two eggs, stiffly beaten.

Method. Boil the water, add the salt, then the cornstarch, either blended with sugar or rubbed to a smooth paste with a little cold water. Cook in a double boiler for 30 m., or for 15 m. if cooked directly over the fire. In the latter case the mixture should be constantly stirred to avoid burning. Remove from the heat, and while still in the saucepan beat in the stiffly beaten whites of eggs. Add the lemon juice, beating this in also. Mold and chill.

Repeat this pudding, using the following method. Add the lemon juice, sugar, and cornstarch at the same time, and cook them together for 15 to 30 m.; then proceed as before.

Compare the flavor and consistency of the two puddings.

Orange Sponge

Omit the lemon juice, and substitute orange juice for part or all of the water. A good proportion is half and half, orange juice and water. Cook the cornstarch in this

mixture for half the time allowed for the lemon sponge, add the sugar, then the beaten whites of eggs. Mold, etc., as before.

Compare the flavor and consistency of this pudding with that of the lemon pudding made by the first method.

NOTE. The lemon and orange sponge puddings were chosen for the purpose of illustrating a principle in the cooking of starch and a principle in the cooking of lemon juice. Other delicious sponge puddings may be made by using grape juice, huckleberry juice, the juice from canned or preserved fruit — that from canned cherries being particularly good — or indeed almost any fruit juice or fruit pulp.

Experiments to Illustrate Methods of Inducing Chemical Change in Starch

Prepare a starch paste by boiling for a few seconds five grams of pure potato starch with 500 cc. of distilled water. The starch should be rubbed to a paste in a little of the water before it is boiled, and this portion stirred into the remainder of the water as it boils.

Prepare a solution of iodine by dissolving two grams of potassium iodide in 100 cc. of water. Add to this one gram of pure iodine, and shake the whole well together. This solution may be stored for future experimentation, but should be diluted to a strength of 2½ per cent, or 5 cc. of the solution to 200 cc. of water, before use.

1. To 15 cc. of the starch paste in a test tube add two drops of a 20 per cent solution of sulphuric acid. Boil for some minutes, testing from time to time by taking out a drop on the end of a glass rod, dropping it on a dish, and adding to it one drop of the diluted iodine solution.

2. To 15 cc. of the starch paste in a test tube add a little malt flour. Heat gently to blood-warm, and maintain at this temperature in a water bath for several minutes. Test from time to time as before.

3. In two test tubes, A and B, collect small quantities of saliva. To A add an equal volume of lemon juice, vinegar, or any acid used in the preparation of food. Let the mixture stand for a few minutes, then add to tubes A and B a volume of the starch paste equal to the contents of each tube. Keep the two in a water bath at about blood-warm temperature and test their contents from time to time with iodine until no color change occurs in B.

TOPICS FOR STUDY OR DISCUSSION

1. The structure of the cereal grains in general. Diagrams of the starch grains of the cereals.
2. The composition of the cereal grains in general. The particular grains which are richest in protein, in fat, in carbohydrate, in minerals. How methods of manufacture of various cereal preparations affect or modify their original composition.
3. Comparison of the cost and nutritive value of the ready-prepared cereals, such as shredded wheat biscuit, puffed rice, or corn flakes, with that of two or more of the grains which need cooking before being served. The basis of this comparison might be the 100-calorie portion. (See charts, page 218.)
4. National customs with regard to the use of cereal grains in the diet.
5. The structure of starch grains in general.
6. A comparison of the differences in the structure of the starch grains of different cereals, of potato, arrowroot, etc.
7. The starch-digesting ferments in the grains; in the human digestive secretions. Conditions which inhibit the action of these enzymes. Some steps in the digestion or hydrolysis of starch.
8. The cycle of carbon in nature.

QUESTIONS

1. Reviewing the work of your course so far, name as many foods as you can which have the flavor decidedly

developed by cooking; which are rendered more digestible by cooking; which are rendered less digestible by cooking.

2. Discuss the advantages and disadvantages of the double boiler as a cooking utensil.

3. What cereal is the most nutritious, that is, yields the largest amount of protein and calories for the smallest cost? (See charts, page 218.)

4. Which of the cereal preparations, considering its nutritive value, is the most expensive? What justifies the purchase of the more expensive preparations? In what cases might the saving of time, labor, and fuel be more than equivalent to the extra cost of an expensive, ready-prepared cereal? In what cases might the housewife more profitably utilize her own time and energy in the preparation of the breakfast cereal?

5. Why did the cereal cooked by Method 5–A become thinner or more liquid in consistency than the other two parts of the same cereal experimented with in this step of the lesson?

6. Account for the alteration in the flavor of the lemon juice brought about by the second method of cooking the lemon sponge pudding. What rule regarding the method of using lemon juice in cooking can you frame from this experience?

7. Account for the difference in consistency of the orange sponge as compared with that of the lemon sponge made by the first method.

8. Why is it especially important that a breakfast mush or porridge should be thoroughly cooked? Can you infer from any of the steps in your formal experiments why a cereal that is so prepared as to be readily swallowed needs more thorough cooking than a dry-cereal preparation?

9. Discuss fully the effect of acid on starch; of acid on the action of saliva. Frame, on this basis, some rules for the correct preparation of starchy foods; for correct combinations of starchy foods with fruits, etc.

10. Trace the relation of your experiments to the practical work of this chapter.

EXERCISES

1. Devise a method for raising the temperature of the contents of the inside part of a double boiler. Consult your instructor before demonstrating your method.

2. Demonstrate three acceptable methods of utilizing left-over cereal.

3. Using three different starchy materials — flour, cornstarch, and arrowroot — make three small molds, using equal quantities of liquid, so as to estimate the proportion of each starchy substance which is needed to stiffen a mold. Begin with one tablespoonful of arrowroot to a cup of liquid. Recall the experience you have already had with flour and cornstarch as a means of determining what initial amount of each you shall use in this experiment.

4. Combine cornstarch, lemon juice, gelatine, and white of egg, together with sugar, in some dish, showing how you have dealt with each of the first four substances so as to make it contribute as effectively as possible to the success of the dish.

5. By means of two simple dishes, show the effect of water and heat, and water, heat, and acid, on the same quantity of any starchy food so as to illustrate in each case the degree of solubility (or hydrolysis) brought about by the reagents used.

6. Make a chocolate sponge pudding.

7. Make a Turkish pilaff, using such a proportion of rice, chicken (or veal), etc., as to make a good nutrient ratio.

8. Using the 100-calorie portion, plan and carry out a combination of foods, including one of the cereals, in one or more dishes which shall furnish a balanced ration for a breakfast for one or more persons.

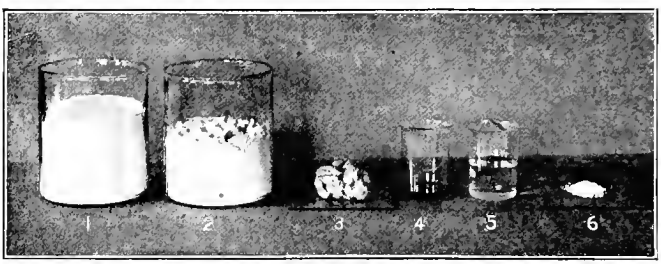
References

Bailey. Sanitary and Applied Chemistry, Chaps. XI and XIII.
Chittenden. Physiological Economy in Nutrition, Chap. I.
Church. Foods, Part II.
Jordan. The Principles of Human Nutrition, Chaps. II and V.

Hutchison. Food and Dietetics, Chaps. X and XI.
Parloa. Home Economics, see Index.
Sherman. Chemistry of Food and Nutrition, Chap. IV, ed. 1920.
Smith. What to Eat and Why, p. 47. (Ed. 1911.)
Thompson. Practical Dietetics, see Index.
Wiley. Foods and their Adulteration, Part V.

CHAPTER XV

FLOUR MIXTURES AND LEAVENS



Analysis by Students.

ANALYSIS OF 1 LB. OF FLOUR

1. 1 lb. (3 cups) flour.
2. 14 oz. carbohydrates in 1 lb. flour.
3. 1.7 oz. protein in 1 lb. flour.
4. .2 oz. fat in 1 lb. flour.
5. 1.8 oz. water in 1 lb. flour.
6. .1 oz. minerals in 1 lb. flour.

PART I. BATTERS

To the Student. As soon as you have a good working knowledge of the scientific principles which underlie many cooking processes, and have gained some amount of skill in the simple technique of everyday dishes, you should be able to use the art of cooking, like any other art, as a means of self-expression. The art of cooking is chiefly the art of making things taste good, of developing, modifying, or enhancing flavor, of making delicious combinations of different substances in one dish. As you gain more and more freedom in the use of this art your cooking will become more and more individual, so that if

you really have the gift your cooking will finally be as distinctive as your handwriting, and your friends will enjoy things to eat in your house that they cannot get anywhere else.

In the work in Flour Mixtures you will find a great deal of scope for originality and invention. You will learn from the selected recipes that certain things are essential in every batter or dough. These have to be carefully measured, and their proportions correctly observed. But there are many more things which are non-essential, and it is chiefly on these that the flavor of the dish depends. On your ability to use the non-essentials, or the condiments, with judgment, as well as on your ability to manipulate skillfully where manipulation affects flavor, will depend your success in originating delicious combinations as soon as your experience warrants your attempting new departures.

THE THIN BATTER

A thin batter is one that has the consistency of heavy cream, or molasses, or such a fluid as will be so thick as barely to find its level immediately on pouring from one vessel to another. This mixture usually calls for equal parts of flour and wetting. No exact proportion of either of these ingredients can be given, since many liquids, such as milk, contain solids in suspension in varying degree, and the thickening property of different brands of flour varies even more. Judgment has to be used in adding the dry materials to the wetting, so as to make a batter of the proper consistency; but fortunately a very little experience is sufficient to give a fair working knowledge.

EXAMPLES OF THE THIN BATTER

Griddle Cakes or Pancakes

Ingredients.

2 cups flour.
½ teaspoonful salt.
1 teaspoonful baking soda.
2 cups sour milk, just clabbered.

Method. Mix and sift together the dry ingredients, being careful to sift the soda free from lumps. Add the dry ingredients to the liquid, stir to a smooth batter, beat until bubbling, and cook by pouring a measured quantity at a time on a hot, slightly greased griddle. This recipe will make sixteen cakes.

For your individual experimentation it will be better to use one-eighth of the quantity; that is, to work on the basis of one-quarter of a cup of flour. This will make two small cakes, and if you cook one of these on a greased griddle, and the other on a soapstone — if one is available — and compare the appearance, flavor, and tenderness of the two, you will learn something interesting.

Sweet Milk Griddle Cakes, or Pancakes

Substitute sweet for sour milk, and baking powder for soda. Two teaspoonfuls of baking powder may be allowed to one cup of flour.

Compare the thickness of the batter in each case, and the lightness and flavor of the cakes.

NOTE. The foregoing are the simplest forms of the pancake batter, or, one may say, the elementary forms of this mixture. From working with this minimum of ingredients at first (and remember, a good cook can obtain excellent results under these conditions) you will be much better able to appreciate the effect of adding other substances to your batters. The addition of these substances may be studied in the following.

VARIATIONS ON THE PANCAKE BATTER

To Improve the Lightness of the Batter. Stiffly beaten egg, added to either of the pancake mixtures, will make them lighter, and this effect will be more pronounced if the yolks and whites are beaten separately, and the stiffly beaten whites added the last thing. One egg to every cup of flour is an ample allowance, and since an egg is in large part a liquid, from one-eighth to one-quarter of a cup of the milk may be subtracted for every egg used. Judgment and experience, however, will enable you to form rules for yourself in this matter. In the case of the sour-milk cakes, additional lightness may be produced by using baking powder in addition to the soda, part for part; that is, one teaspoonful of baking powder for every teaspoonful of soda called for by the recipe.

To Improve the Consistency of the Cakes. The addition of butter, or some form of shortening, to the batter will make the cakes tender. This shortening may be melted and stirred the last thing into the batter. From one to two tablespoonfuls to one cup of flour is an ample proportion.

To Improve the Flavor of the Cakes. A small amount of sugar, from one teaspoonful to one tablespoonful for each cup of flour, will give a mellow flavor, taking off the rough edges, as it were, and imparting what may be called a " finish " to the taste of the dish. A little molasses is sometimes used, but in either case you should be very careful not to use the sweetening in excess, or so that the sweet taste can be observed. The sugar should be flavoring but not sweetening.

DERIVATIVES OF THE PANCAKE BATTER

Cooked rice, or other cooked cereal, stirred into the batter cup for cup, or less, will make delicious cakes.

Fine, sifted bread crumbs may be substituted either wholly or in part for the flour. In this case much more liquid will be needed, the amount depending on the staleness of the crumbs.

Berry griddle cakes have huckleberries, blueberries, or any suitable berry stirred into the batter the last thing. Chopped apples could also be used, or dried fruit.

Mashed potato, about half as much potato as pancake batter, makes delicious cakes, and squash used in the same way will be relished as a variety.

Graham, buckwheat, and other kinds of flour will yield pancakes after their kind, so that a great variety of breakfast cakes may be constructed on the original, fundamental recipe.

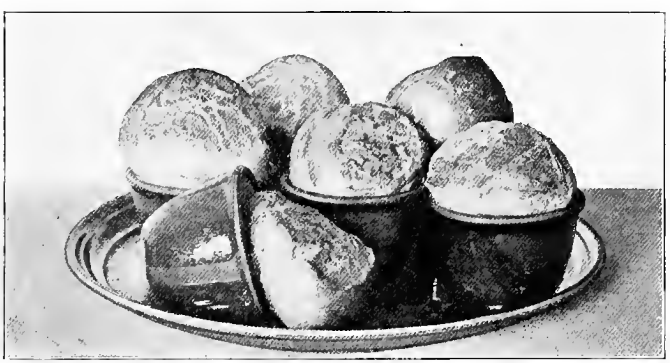
Fritter Batter 1. This is a pancake batter made with sweet milk, eggs — one or two to a cup of flour — only one teaspoonful of baking powder to a cup of flour, and only a trace of butter, one teaspoonful or less, to a cup of flour, to give smoothness. An excess of fat will cause the fritter to fly to pieces if fried in deep fat. This thin fritter batter may be used for corn fritters, or any fritter which is cooked in a shallow pan by the method known as sautéing, or for oyster fritters, sliced apple fritters, or others which are merely coated with batter and where the shape of the food so coated is meant to be preserved.

Waffles. This is the sweet milk batter, enriched by eggs, and with a tablespoonful of butter, or more, allowed to each cup of flour.

French Pancakes. These are just common pancakes,

with or without eggs or butter, as you prefer, but made very thin, and glorified by being spread with jelly, rolled like a jelly-roll, and served with a sifting of powdered sugar.

Popovers. This is a thin batter made of one cup of flour, one-quarter of a teaspoonful of salt, one cup of milk, and one egg. The first three ingredients are mixed to a smooth batter, then the unbeaten egg is dropped into the bowl and the whole is beaten vigorously with a Dover beater for 5 m. The batter is then poured into well-greased popover cups, and baked until big, inflated bubbles swell up over the cups.



POPOVERS

Popovers may be served hot and fresh from the oven, with butter, for breakfast; or they can be filled with apple sauce, through a hole punched in the top, and served for a luncheon dessert.

Chopped raisins or currants may be added to the popover batter for variety.

NOTE. A skillful cook can make popovers or "puffs" without the use of egg, which is added merely to give more tenacity to the batter. Popovers can be baked with gradually increasing heat, when they

will puff up better and retain their shape better. Or they can be put at once into a very hot oven, when a crust will immediately form, and later will probably be ruptured, the mixture "popping" out at the sides. When baked by this method they will very likely be soft in the inside. (Why?) From one-half to three-quarters of an hour will be needed for the baking, and the oven door must not be opened for the first fifteen minutes — and then only enough to take a little peek, to see that everything is going right.

THE THICK BATTER

A thick batter is one that will not immediately find its level when poured into the baking pan, but will require perhaps a minute, or even more, to settle. This mixture usually calls for twice as much flour as wetting, though, as in the case of the thin batter, much will depend on the kind of flour used. The given proportions in any of these rules will have to be modified by judgment and experience.

The thick batter is also called the drop batter, or the muffin batter.

EXAMPLES OF THE THICK BATTER

Muffins (Standard Recipe for)

Ingredients. Two cups of flour, one-half teaspoonful of salt, four teaspoonfuls of baking powder, two to four tablespoonfuls of butter or other shortening, one cup of liquid, which may be three-quarters of a cup of milk or water, and one egg.

Method. Sift the dry ingredients, and rub the shortening into the mixture with the tips of the fingers; or it may be melted and added as in pancakes. Beat the egg, add the milk, then stir the dry materials into the liquid until a smooth batter, of the right consistency, is formed.

This is poured or dropped by spoonfuls into greased muffin pans and baked in a hot oven for about 20 m., or until the muffins are well browned, firm to the touch of

the finger, and have shrunken slightly from the sides of the pans.

The quantity given will make eight large muffins.

Variations. Cold boiled rice, or any left-over breakfast cereal, may be added to the muffin batter in equal parts, or less, as in the case of pancakes. For good muffins, however, extra leaven in the shape of either eggs or baking powder should be added to overcome the heaviness apt to result from the addition of the cereal.

Graham, whole wheat, or other kinds of flour or meal may be used, as in pancakes, singly or in combination with the wheat flour.

Berries or fruit can be added, too, or chopped nuts.

Fritter Batter 2. This is a muffin batter made similarly to the fritter batter based on the pancake mixture; that is, one enriched by eggs, but with only a very little butter. This thicker fritter batter is appropriate to use where fritters of chopped fruit, meat, or fish are dropped by spoonfuls into deep fat, and irregular, " lumpy " shapes result. Banana fritters made in this way are particularly good. (See Chapter XIII, page 123.)

Steamed Puddings. A muffin batter, sweetened with about half as much sugar as flour, made as plain or as rich as you please, and spiced, if you like it, with nutmeg or clove, one teaspoonful to a cup of flour, makes an excellent steamed pudding. Chopped apples, peaches, figs, raisins, or fresh berries may be added if desired.

Quick Cakes. The steamed pudding mixture described above will, if baked, yield an astonishing variety of quick cakes, cakes that are made quickly and are meant to be eaten quickly — while hot from the oven, if you wish.

STUDY OF THE EFFECT OF VARIOUS INGREDIENTS, ETC., IN FLOUR MIXTURES

The following studies may profitably be made, if time allows, either in school or at home.

Effect of Egg in a Flour Mixture

1. Make a thick batter, on the basis of one cup of flour. Omit the butter, but add sugar and fruit as directed for a steamed pudding. Steam for one hour in a greased mold.

2. Make a similar batter, but add, just before the fruit is put in, one well-beaten egg. Steam as before.

3. Make a third batter, to which an egg is added in the following manner: Separate the yolk and white. Beat the yolk, and add it to the milk; beat the white stiffly, and cut or fold it into the batter the last thing. Steam as before.

Compare. Which pudding rose the highest? Which the next highest? How much baking powder could be deducted when beaten egg is used? How much when the yolk and white are beaten separately?

Which batter was the softest? (Note in which the fruit sank the most.) How much flour could be added to make up for the "wetting" effect of the egg? (This might be the basis of a new experiment.)

Butter and Egg Complemental in a Flour Mixture

1. Make a thick batter, using flour, salt, baking powder, sugar, with milk and egg in equal parts for wetting. Mix as usual, and bake in greased gem pans.

2. Make a thick batter, using the same dry ingredients as before, but omitting the egg and using milk alone for the wetting. Add to the batter melted butter in the pro-

portion of two tablespoonfuls for every cup of flour used, stir the mixture well, and bake as before.

3. Make a batter similar to 1, but stir into this for the last thing melted butter in the same proportion used in 2. Bake as before.

Compare. Which muffin was the tenderest? Which the toughest? Which rose the highest? Which rose the least? What ingredient contributed to the toughening of the mixture? What ingredient counteracted this effect? Which of the ingredients helped the mixture to rise? Which seemed to retard the rising?

Can you estimate what proportion of butter is complemental in its effects to the effect of one egg in an ordinary flour mixture?

Experiments in the Use of Bread Flour and Pastry Flour

1. Using one of the "strong" bread flours, make one or two plain muffins, pancakes, or other simple mixture where there is not too great a variety of ingredients to obscure the results.

2. Using a fine pastry flour, repeat the mixture made in 1, being careful to maintain the exact proportions of wetting, leaven, etc., used in the first case.

Compare. Which flour made the thicker batter? Which made the finer-grained and tenderer muffin? Which muffin had the more decided flavor?

3. Using exactly equal quantities of bread flour and milk, with the usual proportion of salt, make a thin batter, beat with a Dover beater for 5 m., pour into hot iron gem pans, and bake as for popovers. This is one of the standard recipes for wheat puffs.

4. Repeat, using whole-wheat flour.

5. Repeat, using pastry flour. Note particularly that the proportion of flour and liquid in each case is to be equal, irrespective of the thickness of the batter.

Compare. Which flour made the lighter puffs? Which the tenderer? Which formed the larger-sized and fewer, and which the smaller-sized and more numerous holes in the process of baking? What could be added to the flour which yielded the poorest results in this experiment to supply the property it lacks?

Experiments to Aid or Corroborate Inferences

1. Compare flour from spring and winter wheat, *i. e.*, bread and pastry flour, as to

Color — whiter or yellower.
Texture — fine and smooth, or slightly gritty.
Cohesion — (by squeezing a handful in the hand and noting whether it retains shape produced by pressure).
Weight *vs.* Volume.
Thickening property.

To test the thickening property, mix a given quantity (two tablespoonfuls will do), of each kind of flour with an equal volume of water in separate small bowls. Note which kind makes the thicker batter. Add to the thinner batter sufficient flour to make it equal the other in thickness, adding only a carefully measured one-quarter teaspoonful at a time. Determine from your experiment what proportion of the weaker flour has to be used as compared with the stronger.

2. Tie one tablespoonful of each kind of flour in a five-inch square of cheesecloth. The mouth of these improvised bags should be tied tightly, but ample room must be allowed to manipulate the contents of each. Place each bag in about a cupful of water in a bowl, and knead the flour with the fingers until everything that will come through the cheesecloth has been worked out, and the

mass left in the bag feels "rubbery." Open the bags, and compare the residues from the two kinds of flour. Which is the tougher? the yellower? the larger in quantity? Test this substance for protein.

3. Allow the liquid to settle, and decant it carefully. What is the residue? Set this aside to dry, and compare the weight of each portion.

4. Test a portion of the decanted liquid for lime. (What test will you use? See Chapter XII, page 104.)

5. Test another portion for potassium. (What test will you use for this? See Chapter II, page 11.)

6. Filter another portion until quite clear; then apply heat. What do you observe? What is your inference?

7. Shake up a small amount of flour with twice its volume of ether in a test tube. Does the ether seem to dissolve any substance in the flour? Decant the liquid on to a piece of filter paper and let this stand until the ether evaporates. What is the nature of the stain on the filter paper?

8. Treat two tablespoonfuls of flour with four or five times its volume of a 10 per cent salt solution, placing the mixture in a flask and shaking it from time to time. Filter, and drop some of the clear filtrate into a large beaker of pure water. A cloudiness, or a very slight milky precipitate, indicates the presence of a class of proteins called globulins. (See Chapter XI, page 97.) Probably only a trace of this substance will be discerned. Better results may be obtained by allowing the flour to remain in the salt solution for several hours, or overnight.

TOPICS FOR STUDY OR DISCUSSION

1. The structure of the wheat grain in detail.
2. The average composition of wheat.

3. Varieties of wheat and their characteristics.
4. The cultivation of wheat; the effect of time of sowing, of soil, climate, and other conditions.
5. The manufacture of flour; how the composition of the product is affected by the process used. Various grades of flour; different varieties of flour, such as Graham, whole wheat, etc.
6. Gliadin, glutenin, and gluten.
7. The globulins; where found in animal and vegetable foods.
8. Forms other than flour into which wheat is manufactured.
9. Cereals other than wheat used in the manufacture of flour.
10. The great wheat-growing regions of this and other countries. Imports and exports of wheat.
11. Some great national crises in which this grain played an important part.

QUESTIONS

1. Why were the sour-milk griddle cakes thicker, tenderer, and better risen than those made from sweet milk?
2. Name the four essential ingredients in flour mixtures such as those studied in this chapter. Name the non-essentials.
3. State the general proportions of salt, baking powder, and liquid that might be used with one cup of flour to make a thin batter; to make a thick batter.
4. Trace the relation of the experiments to the practical work of this chapter. What constituent of flour, isolated in your formal experiments, is most important as affecting the other ingredients in a batter?
5. Enumerate in order, and illustrate by examples, the principles of proportion, combination of ingredients, and methods of mixing, gained from the whole of the work outlined in this chapter.
6. Compare flour and milk, considered as perfect foods.

EXERCISES

The exercises on this subject may be chosen from the various derivatives of the thin and the thick batter.

References

Bailey. Sanitary and Applied Chemistry, Chap. XII.
Church. Foods, Part II.
Jordan. The Principles of Human Nutrition, p. 52.
Hutchison. Food and Dietetics, Chaps. XI and XII.
Lassar-Cohn. Chemistry in Daily Life, Lecture IV.
Sherman. Chemistry of Food and Nutrition, see Index, "Wheat."
Snyder. Human Foods, Chap. X.
Thompson. Practical Dietetics, see Index.
Wiley. Foods and their Adulterations, Part V.
Jago. Science and Art of Breadmaking, see Index.

HOW TO MEASURE DRY MATERIALS

The cup at the right can be used either for liquids or dry materials

CHAPTER XVI

FLOUR MIXTURES AND LEAVENS — *continued*

PART II. DOUGHS

THE SOFT DOUGH

A soft dough is a mixture which is sufficiently firm to stand without support at the sides. It is thus distinguished from a batter by possessing in a greater degree what the texts on physics tell us are the properties of a solid rather than the properties of a fluid. It does not, however, fulfill all the requirements of a solid as enumerated in the physics texts, for not only will it not "sustain pressure without being supported laterally," but it will even spread a little if left quite to itself. But it will not, like the batter, which is a true fluid, ever find its own level. The soft dough usually calls for three times as much flour as liquid, but this proportion has to be modified according to the conditions stated in the rules for batters.

EXAMPLES OF THE SOFT DOUGH

Emergency Biscuit

As its name implies, the emergency biscuit can be made in a time of stress, or under difficulties. It does not call for the use of a molding board, a rolling pin, or a

biscuit cutter. It takes less time to mix than any other batter or dough, its appearance is novel, and its flavor is good.

Ingredients. Two cups of flour, four teaspoonfuls of baking powder, one-half teaspoonful of salt, two to four tablespoonfuls of butter, fresh lard, or other shortening. Two-thirds of a cup of liquid are required. This may be milk, water, or a mixture of both. Or in case of need it may be egg beaten in water, in the proportion of one egg to a pint of water.

Method. Mix and sift the flour, salt, and baking powder. Chop the shortening into the dry ingredients, using the back of a steel-pronged fork. Do not chop it too fine; bits the size of half a pea will be small enough. Add the dry ingredients to the liquid, and mix very lightly, with as little manipulation as possible, until a soft dough is formed. The dough should be rather moist, and spongy, and porous. It should be so soft that it will spread if left without support at the sides, yet it should be so stiff that it will remain rough on top when it is dropped by spoonfuls into greased muffin pans. Bake in a hot oven. Shortly before removing from the oven the tops should be brushed over with milk, if this has not been used for the wetting, or with a mixture of sugar and water — two teaspoonfuls of sugar to a cup of water. (Why?)

DERIVATIVES OF THE SOFT DOUGH

Simple luncheon buns, or tea cakes to be served hot, may be made by adding to the biscuit mixture sugar, spice, fruit, either fresh or dried, nuts, chocolate — or even chopped, cold meat.

The orthodox **baking-powder biscuit** is this same dough,

made just a little stiffer, so that it can be rolled out on a molding board and cut with a biscuit cutter.

The shortcake, in strawberry or peach time, is the same dough, with the maximum of shortening, rolled out and baked, split open while hot from the oven, spread with a mixture of fruit and sugar, the split halves put together and more fruit and sugar piled on top, and a blanket of whipped cream spread over all.

The cruller, to be fried in deep fat, has beaten egg and milk, half and half, for the wetting, is slightly sweetened — perhaps two tablespoonfuls of sugar to a cup of flour — is spiced with cinnamon, lightly rolled, cut out with a cruller cutter, fried according to the rules for frying an uncooked mixture (see Chapter XIII, page 122), and dusted over with powdered sugar before serving.

A plain crust for a meat pie, or for a deep-dish fruit pie, can be made from this dough. It can be used also for dumplings. (See Chapter XI, page 92.)

THE STIFF DOUGH

A stiff dough is one that will not cling to the sides of the mixing bowl, one that can be handled without adhering to the fingers, one that can be rolled out quite thin without sticking to the rolling pin or the molding board. The proportions for such a mixture depend more on the ability of the cook to manipulate skillfully and with a light touch on the rolling pin than on any given measurements, or than even on the kind and quality of flour used. Four times as much liquid as flour is often given as the proportion for this mixture, but the less flour used the crisper and lighter will be the dough.

EXAMPLES OF THE STIFF DOUGH

Plain Pie Crust

Ingredients.

1 cup flour.
¼ teaspoonful salt.
⅓ cup shortening.
¼ cup water, cold as possible.

Method. Sift flour and salt together. Chop the shortening into the flour, add the liquid, and mix lightly to a dough. This should be so stiff as not to stick to the sides of the mixing bowl. Place the dough on a lightly floured molding board, and roll out to a thickness of one-fourth of an inch. Then fold one-third of this sheet of pastry over toward the center, fold the remaining third over the double sheet formed by the first fold, and roll the whole again until it is one-quarter of an inch thick. Repeat this process until the folding and rolling have been performed three times. Another method is to roll up the sheet of pastry like a jelly-roll once, and then roll out to a thickness of one-quarter of an inch. The disadvantage of this method is that an inexperienced worker will find it difficult to avoid using that "heavy hand" for pastry which crushes out the air caught between the folds, and gives a tough, heavy crust instead of one that is flaky, light, and crisp.

The proportions given will make a lining for two large pie plates, allowing for building up the rim, or will make an upper and an under crust for one two-crust pie. An example of a cream filling for one good-sized pie is given below.

Date Cream Filling

Ingredients. Two cups of rich milk, with flour, butter, and salt in the proportions to make a medium white sauce. (See Chapter II, page 9.) Sugar (one-half cup

or more), dates (one cupful or more), eggs (two, three, or four).

Method. Make a medium white sauce on the basis of two cups of milk. Add the sugar, then the dates, stoned and chopped, and cook at a low temperature until the dates are softened. Add the well-beaten eggs, pour into the lined pie plate, and bake until the crust is brown. If more than two eggs are used a meringue can be made of two of the whites, and the remainder of the eggs used as described in the filling. The meringue is spread on after the pie is baked. It should then be placed in a cool oven to " set " and brown very slightly on the top.

NOTE. Pastry should be put into a very hot oven at first, and the heat reduced after it has browned.

Ginger Snaps

Ingredients.

1 cup flour.
¼ teaspoonful salt.
¼ cup brown sugar.
1 teaspoonful baking powder.
1 tablespoonful dry ginger.
¼ cupful shortening.
¼ cupful water.

Method. Mix and sift together the flour, salt, sugar, baking powder, and ginger. Rub the shortening into the dry mixture. Add this to the liquid and mix to a stiff dough. Roll out very thin, cut into rounds, and bake for from 5–8 m. in a hot oven.

Nut Cookies

Ingredients.

2 cups flour.
½ teaspoonful salt.
2 teaspoonfuls baking powder.
½ cup sugar.
½ cup shortening.
1 egg.
2 tablespoonfuls milk.
½ to 1 cupful chopped nuts.

Method. Cream the butter, add the sugar, add the egg, previously well beaten, add the flour — sifted with

the salt and baking powder — alternately with the milk; lastly stir in the nuts. Roll out moderately thin, cut into rounds, and bake for about 10 m.

Hard Gingerbread

Ingredients.

2 cups flour.
1 tablespoonful ginger.
½ teaspoonful salt.
½ teaspoonful baking soda.
¼ cup butter.
½ cup molasses.

Method. Mix and sift the dry ingredients, heat the molasses gently, and stir in the butter until it is dissolved; then add the dry mixture. Roll thin, and spread the sheet of dough on the inverted bottom of a dripping pan. Bake in a quick oven.

NOTE. The gingerbread is less apt to burn if baked on the inverted bottom of a pan than if baked in the ordinary way. Can you infer a reason for this?

I

The Effect of Combining Certain Leavens, or Using them Singly

1. (*a*) Make a thick batter, using flour, salt, and sweet milk. Use baking soda alone for the leaven, in the proportion of one teaspoonful to a pint of milk. Add melted butter the last thing, one tablespoonful to a cup of flour. Bake in muffin pans. (*b*) Make a thick batter as before, using sour milk, just nicely loppered instead of sweet, and using soda alone for the leaven. (*c*) Make a third batter, using the same ingredients as in *b*, but adding as much baking powder as soda. (*d*) Make a muffin batter with sweet milk and baking powder in the standard proportions.

2. Compare the first three muffins with the last, taken as a standard. Which of the muffins had a yellow tint

and an unpleasant taste and odor? Which muffin rose the highest? Was this a little yellow? Account for the yellow tint. How could it be avoided? Which muffin rose the least? Was this yellow? Suggest some means of making this muffin lighter.

II

The Nature of the Gas Evolved

1. Into each of three test tubes put an equal amount of baking soda. Add to the three tubes, respectively, four times as much vinegar, sour milk, and molasses as the amount of soda used. (The liquids may be measured, allowing 1 cc. to a gram, or two tablespoonfuls to an ounce.) Note the height to which the effervescence rises in the tubes; note the speed of the action; test what gas is given off.

2. To a small amount of baking powder in a test tube, the same kind used in your practical work, add three times its volume of water. Test what gas is given off.

3. To baking soda alone add water, and heat.

III

Study of Baking Powders

1. To a given number of grams of tartaric acid, $H_2C_4H_4O_6$, add sufficient baking soda, $HNaCO_3$, to liberate the gas from the latter, according to the equation

$$H_2C_4H_4O_6 + 2HNaCO_3 = Na_2C_4H_4O_6 + 2H_2O + 2CO_2$$

Treat the mixture with water, and note the amount of effervescence, first on adding cold water, and later, when the first action has ceased, on heating the mixture gently.

2. To a given number of grams of cream of tartar,

$KHC_4H_4O_6$, add sufficient baking soda to liberate the gas according to the equation

$$KHC_4H_4O_6 + HNaCO_3 = KNaC_4H_4O_6 + H_2O + CO_2$$

Proceed as before, noting the amount of gas given off, first in the cold, then after heating slightly.

3. Combine, as before, calcium acid phosphate, $CaH_4(PO_4)_2$, with baking soda according to the equation

$$CaH_4(PO_4)_2 + 2HNaCO_3 = CaHPO_4 + Na_2HPO_4 + 2H_2O + 2CO_2$$

Test as before what conditions are necessary for complete evolution of the gas.

4. Combine ammonia alum, $NH_4Al(SO_4)_2$, with baking soda according to the equation

$$2NH_4Al(SO_4)_2 + 6HNaCO_3 = 2Al(OH)_3 + 3Na_2SO_4 + (NH_4)_2SO_4 + 6CO_2$$

Test as before whether or not all the gas is given off in the cold.

5. Estimate the weight in grams of each baking powder that would be required to raise one cup of flour. (It is supposed that 475 grams of carbon dioxide are needed to raise one pound of flour.) Compare the amount of baking powder needed according to your estimate with that called for in your recipes. Account for the discrepancy, if there is one. In the commercial baking powders from 20–25 per cent of starch is used as a "filler" to prevent the ingredients from acting on one another. This should be allowed for in your estimate.

Note on "The Effect of Combining Different Leavens," etc.

I (*a*). When baking soda alone is used as a leaven there will be an evolution of carbon dioxide from its decomposition by heat. The volume of gas given off will be in proportion to the amount of soda used, and the mixture will rise in proportion to the volume of gas. But the method prescribed in this step is meant to be a warning rather than an example, for the residue left after the decomposition of the

carbonate will discolor the flour mixture and impart an unpleasant taste and odor. It is hardly necessary to say that the product is unwholesome, for the disagreeable effects will be a safeguard against its being eaten in such quantity as to do harm.

I (*b*). In the souring of milk only a very small amount of lactic acid is formed, from .4 per cent (when the milk will taste sour) to 1 per cent. It is true that other acids are usually present, but the total acidity in milk is seldom sufficient in amount to call for enough soda to give off enough carbon dioxide to raise the mixture. If the acid is present in too small amount to decompose the proportion of soda usually prescribed, that is, one teaspoonful to a pint of milk, the excess of the soda will be decomposed under the influence of heat, thus liberating the gas, but discoloring the mixture in the same way, though not to the same extent, as when soda alone is used as a leaven. (See I, (*a*).)

The correct amount of soda to use with sour milk can be determined scientifically by experimenting with a small quantity of the milk, adding soda to it in definite small amounts, testing with litmus after each addition, and when the neutral point is reached calculating the amount needed for the volume of milk to be used for the particular mixture in hand. The long patience necessary for such a process will dissuade most of us from attempting it, as will the knowledge that such painstaking would be scorned by our grandmothers, who added their saleratus to the milk "according to their judgment," and could unerringly tell by tasting the mixture whether or not they had added enough.

I (*c*). Recalling what has been stated under I (*b*), it may be inferred that soda alone, measure ye never so wisely, will not find enough acid in sour milk to act upon with the result of liberating enough gas to raise the mixture. Therefore, in practice it is found that baking powder, if added in equal amount with the soda, will give the desired lightness, while the better flavor of the sour milk cakes will be present.

I (*d*). The muffin made by this process is meant to be the standard, as regards the degree to which it has risen. If muffin (*c*) is higher this signifies that so much baking powder need not have been used as an aid to the soda and acid.

III (1, 2, 3, and 4). The amount of baking powder to be used in any flour mixture depends on the constituents of the powder. For instance, tartaric acid, whose molecular weight equals 150, when combined with sodium bicarbonate will release a weight of carbon dioxide equal to 88. Cream of tartar, molecular weight 188, releases an amount of gas to equal 44. Calcium acid phosphate, molecular weight 234, will release gas equal to 88. Alum, 237, releases gas equal to 132. Assuming that a teaspoonful of any of the baking powders of commerce approximates in weight a teaspoonful of any other, the amount of gas evolved by a cream of tartar powder may be represented by 1, a tartaric acid by 2, a phosphate by 2, and an alum by 3. This is somewhat offset by the greater stability of the cream of tartar powder, owing to its slowness to dissolve, so that the evolution of gas is not complete until heat is applied to the batter.

PROBLEMS IN PRACTICAL WORK

Boston Brown Bread

Make a thick batter, using equal parts of corn meal, rye meal, and Graham flour. The wetting is to be equal parts of molasses and sour milk. Use soda for the leaven, helping it out by adding an equal volume of baking powder.

Steam one hour for every cup or fraction of a cup of dry ingredients used.

Problem. To estimate the amount of soda.

Vinegar Cake

To one cup of water add three tablespoonfuls of cider vinegar. Use this mixture, or part of it, as the wetting for a rich muffin batter, using half as much sugar as flour and half as much butter as sugar.

Problem. To estimate the amount of soda needed for the leaven. Commercial vinegar contains about 6 per cent of acetic acid.

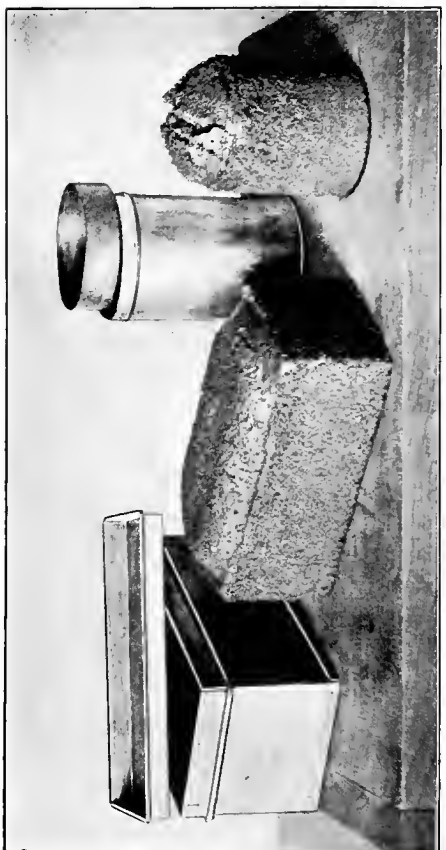
Soft Molasses Gingerbread

Make a thick batter, the wetting to be three parts of molasses to one part of water. Use one-fourth as much butter as flour, and one-fourth as much ground ginger as butter.

Problem. To determine the kind and quantity of leavening.

Cream Puffs

Add one-half cup of butter to one cup of boiling water, and cook the two together until the butter is melted. Add one cup of flour, sifted with the right amount of salt,



BOSTON BROWN BREAD

and stir the whole quickly until a smooth ball is formed which will not stick to the sides of the saucepan. The flour must be added all at once, so that the temperature of the boiling mixture may be sufficiently lowered to prevent lumping. Remove the saucepan from the fire just as soon as a ball is formed which will not cling to the sides else the mixture may " oil " and the puffs be a failure.

While still hot, break into the saucepan, one at a time, as many eggs as are needed to complement the volume of butter used, beating each one into the mixture until it is thoroughly incorporated before adding the next. When the eggs have all been added, continue to beat the mixture until it will not " string " when the fork is drawn through it.

Drop by spoonfuls on a baking sheet, or on the inverted bottom of a dripping pan, and bake the same as popovers.

Problem. To determine the number of eggs needed. (See Chapter XV, page 148.)

Filling for Cream Puffs. Make a medium white sauce. Add one-half as much beaten egg as milk, and twice as much sugar as flour. Flavor with vanilla, lemon extract, fruit juice, or chocolate.

A pastry bag can be used to fill the puffs, or one can be improvised by making a cornucopia of stiff paper, inserting the end into a small opening in the side of the freshly baked puffs, then pouring the filling into the cornucopia and squeezing the larger end, thus forcing the mixture into the puffs.

NOTE. When the cream-puff mixture is formed, before baking, into a cylindrical shape by passing it through a pastry tube about an inch in diameter, the cakes are called "éclairs." They are filled as usual, and are generally spread with a chocolate icing.

The cream-puff mixture is called by French cooks the "chou" paste.

TOPICS FOR STUDY OR DISCUSSION

1. Different leavening agents — air, steam, carbon dioxide.
2. Various classes of commercial baking powders — tartrate, phosphate, alum, etc. The use of egg albumen in baking-powder manufacture.
3. The nature of the products formed by double decomposition of the substances in the baking powders of commerce. The different opinions regarding the wholesomeness or unwholesomeness of the residues left in the dough from the different classes of baking powder.
4. The need of some elastic and tenacious substance to hold the gas evolved from the baking powder or other leaven.
5. Common adulterants of baking powder; of flour. Tests for these adulterations. The bleaching of flour.

QUESTIONS

1. Discuss the advantages and the disadvantages of adding the dry mixture to the wetting, or conversely, the wetting to the dry ingredients, in mixing a batter or dough. In what cases might one method be more advisable; in what cases might the other be more advantageous to use?
2. Why is not baking soda alone used for a leaven without the addition of an acid?
3. Describe the different ways in which butter may be added to a batter or dough, and the effect of these various methods.
4. Discuss various methods of ascertaining how much soda is required when used as a leaven with sour milk or other acid liquid.
5. Recipes for the use of soda sometimes prescribe that it shall be added to the sour milk or other liquid; sometimes that it shall be sifted in with the dry ingredients. Compare the advantages and disadvantages of both methods.
6. What effect was produced by cooking the flour, butter, and water together in making the cream puffs? Why

was it necessary to the success of the mixture that this effect should be produced? (Try to conceive what would happen if the ingredients were mixed in the usual way.)

7. Besides the carbon dioxide, other leavening agents, such as air and steam, are present in flour mixtures. Enumerate the mixtures in which each of these agents played the most important part; the mixtures in which each had probably the least effect.

EXERCISES

The exercises on this subject may be chosen from the various derivatives of the soft and the stiff doughs.

References

See References for Chapter XV, with the addition of:
Snyder. Human Foods, Chap. XII.
Bulletin 13, U. S. Dept. of Agriculture, Division of Chemistry.

MILK BREAD, FRENCH BREAD, AND RYE-MEAL BISCUIT

CHAPTER XVII

QUICK-PROCESS BREAD

To the Student. Good quick-process bread can be made in a two-hour class period. Excellent quick-process bread can be made at home in from three to five hours.

The quantity of ingredients given in the following recipe will make one ordinary oblong loaf, but for class practice it is better to use only half the amount given and make one-half a loaf, two students baking their portions in one bread pan.

You must be careful not to lose, if possible, a single minute of the time apportioned for each step, so that the loaves may be made, risen, and baked under at least approximately the same conditions, thus facilitating a more correct inference regarding the effect of the different methods and ingredients used.

If your teacher decides to give two lessons to bread making, the first might very well be spent in comparing the effect of making a sponge, with that of kneading what is called a "straight dough," and the second lesson could be given to studying the action of the various "yeast aids" used in bread making. If you are already familiar with the technique of kneading, etc., the first processes may be skipped, and you will be interested in beginning at once on the "yeast aids."

METHODS OF BREAD MAKING

Quick-Process Bread — Sponge Method

Ingredients.

1 compressed yeast cake.
1 to 2 teaspoonfuls butter.
1 to 2 teaspoonfuls sugar.
½ teaspoonful salt.
1 cup liquid (milk, water, or a mixture of both).
3 cups flour.

NOTE. Though three cups of flour are allowed, your bread will be much lighter if you try not to use all of this quantity.

Method. Sift flour, salt, and sugar. Blend the yeast cake in a bowl with a little of the warm liquid until the mixture is smooth and free from lumps. Add the remainder of the liquid, and the butter. Add flour enough to make a thin batter. (*This step of the process should occupy not more than* 7 *m.*)

Set the bowl in a warm place, and cover it with a cloth. A good way to insure an even temperature is to stand the bowl in a pan (dish pan) of warm water, about 112° or 114° F., or in the absence of a thermometer you may judge sufficiently of the temperature of the water by being able to hold your whole hand in it, up to the wrist, for ten seconds by the clock, and hardly a second more. The water must be so high as barely to escape floating the bowl, and the whole thing should be covered with a thick cloth, or the temperature kept up by the addition of hot water from time to time. The contents of the bowl will thus be maintained at a favorable temperature for the growth of the yeast. Allow the mixture to stand until it is spongy and full of holes, and has doubled in bulk. (*This step should occupy not more than* 30 *m.*)

Add to the sponge flour enough to knead into a soft dough, and knead, at first lightly, then more thoroughly, on a lightly floured board until the dough is an elastic

mass which will not stick either to the board or to the hands. (*This step should occupy not more than* 15 *m.*)

Shape the dough into a loaf, place this in a lightly greased baking pan, and let it rise again in a warm place until it has doubled in bulk. If the pan is water-tight it may be allowed to stand in warm water as before. (*This step should occupy about* 20 *m.*)

Bake, with gradually increasing heat, for 45 m.

The loaf should be weighed before and after baking.

NOTE. If a very thick crust is desired, the oven temperature should be low and the baking prolonged. This method gives a nutty-flavored loaf, which is both wholesomer and more delicious.

Quick-Process Bread — Straight Dough Method

Ingredients same as before.

Method. Sift flour, salt, and sugar. Blend the yeast cake in a bowl with a little of the warm liquid until smooth. Add the remainder of the liquid and the butter. Add flour enough to make a soft dough. (*This step should occupy not more than* 7 *m.*)

Knead the dough on a lightly floured board, gently at first, but increasing the pressure as the mass becomes less sticky, and continuing to knead until the dough will no longer adhere to the hands or the board. (*This step should occupy not more than* 15 *m.*).

Set the dough to rise in a greased bowl, placed in a pan of water and closely covered, as already described. Allow to stand until the dough has doubled in bulk. (*This step should be completed in* 30 *m.*)

Remove the dough from the bowl, manipulate lightly, hardly more than shaping with the hands into loaves, and place these in greased pans to rise again in a warm place until once more doubled in bulk. (*This should take place in* 20 *m.*)

Bake as before, with gradually increasing heat, for 45 m.

Remember to weigh before and after baking.

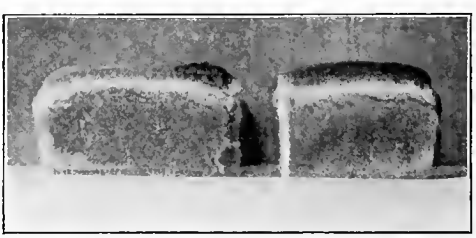
Compare the two loaves. Which rose the highest? Which has the finer and more even grain?

NOTES. A second kneading, after the bread has risen once in the dough stage, gives a finer grain, and this method should be used in making quick-process bread at home.

A single compressed yeast cake will yield, during its growth, sufficient gas to raise eight or more loaves of bread made by the slow, or overnight process. Many housekeepers prefer to use a dried yeast for this method, and when a dried yeast is used a sponge is generally preferred to the "straight dough." The reason is thought to be that a sponge affords better conditions for a re-birth of activity, so to speak, on the part of the yeast cells, since these are in the spore state in the dried yeast, and need longer coaxing before they begin to work than is needed by the compressed yeast, which is merely in a resting state. Once the cells have come out of the spore state, however, they are very active, so that by the time the dough is mixed and kneaded their vigorous growth quickly raises the mass.

The reverse of this appears to be the case with the compressed yeast, whose initial activity is very great, and in actual practice it has been found well to take advantage of this, and knead up the dough at once.

Whenever the slow-process method is used it is advisable to scald the wetting first, to sterilize it, so as to avoid the presence of other organisms than the yeast. These do not have time to do harm during the quick process. Of course if the liquid is scalded it must be allowed to cool to such a temperature as will not hurt the yeast plant.



QUICK-PROCESS BREAD
Made by straight dough and sponge methods

STUDY OF YEAST AIDS

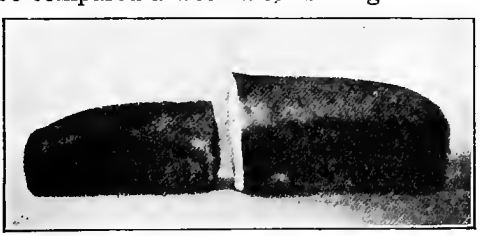
Make a loaf of quick-process bread by the second method, using one or two teaspoonfuls of glucose instead of cane sugar.

Make a similar loaf, using cane sugar, but adding to the dry ingredients one or two tablespoonfuls of malt flour. If this cannot be procured use one or two tablespoonfuls of malt extract, measuring this with the liquid.

Make another loaf, working into the dough one small mashed potato, and using potato water for the wetting — provided the potato has been pared before boiling. The other ingredients given on page 170, including the sugar, should be used here.

Compare the three loaves with the loaf made by the standard method, without the use of a yeast aid. Which is the best risen? Which has the evenest grain? Which the most agreeable flavor?

If time allows, a further study of the keeping qualities of bread may be made, in which comparison should be made of loaves in which the wetting was milk, water, and potato water, respectively, and of loaves made with and without the addition of mashed potato. The loaves should be compared a week after baking.



QUICK-PROCESS BREAD
Made without and with a yeast aid

DERIVATIVES OF THE PLAIN BREAD DOUGH

Crumpets, sometimes called English Muffins.

Use the proportions of flour, salt, and milk for a thin batter. Allow one cake of compressed yeast for every

cup of liquid. Allow from one to two tablespoonfuls of butter for every cup of flour. Proceed as in the sponge method of making quick-process bread, and when the batter is well raised pour into greased muffin rings on a hot griddle, filling them half or three-quarters full. When raised to the top, turn, ring and all, with a pancake turner, and bake until brown on both sides.

These muffins are generally allowed to become cold, then they are split or pulled apart and toasted.

Raised Waffles. Make a thin batter as for crumpets. Add two eggs for every pint of milk, the yolks beaten and used for part of the wetting, the stiffly-beaten whites folded into the mixture just before cooking.

Raisin Bread. This is made on the basis of a thick batter, using one yeast cake, as before, to every cup of liquid. Just before the second rising add, in the following order, for every cup of liquid, two tablespoonfuls of butter, creamed; four tablespoonfuls of sugar, one well-beaten egg, and a half-cupful of raisins.

Doughnuts. These are made on the basis of the soft dough, or the regular bread dough, but one-half cupful of sugar, one or two beaten eggs, and a dash of cinnamon are added to the foundation bread mixture.

Roll, cut out, and fry in deep fat, like crullers.

Coffee Cake. This is made on the basis of the doughnut mixture, with the addition of a little more sugar and about a half-cupful more butter. Form into rather large rings or twists, sprinkle chopped nuts over the top before baking, and dust with powdered sugar before serving.

Election Cake. The coffee-cake mixture, with about a quarter-cup more butter (making from three-quarters to one cup of butter to three cups of flour), one-half to one

RAISIN BREAD

cup more sugar, perhaps an extra egg or two, and then the whole mass can be fairly loaded up with raisins, currants, chopped figs, candied citron, and spices.

NOTE. All the richer derivatives of the bread dough should have a longer time allowed for the rising. No definite number of minutes can be given. The test is that the mixture shall double in bulk. These richer mixtures are more suited for home work.

Plainer derivatives of the quick-process dough are the raised buns or rolls, which are allowed to rise in the pans until feather-light, after sufficient "second kneading" to give a fine grain; the Parker House rolls, which are made by rolling a sheet of the dough to half an inch in thickness, then spreading with butter, folding, and rolling again; lastly cutting out in circles, pressing a furrow across the middle with the handle of a wooden spoon, doubling over along the line of the furrow, and letting rise in the pan until feather-light before baking.

Plain currant buns can be made by working in a handful of currants to the dough, and proceeding as for raised buns.

Other variations can be experimented with as skill and experience are gained.

TO JUDGE A LOAF OF BREAD

In judging bread at county fairs, Farmers' Institute exhibits, or school contests, a score card should be used. This enumerates the various points to be observed in judging a loaf, and the number of credits given for each point. Many schools and colleges get up their own score cards, so that there is a great deal of variety; but though in the details there may be a lack of correspondence, there is general agreement in broadly judging every loaf on the three great essentials of flavor, appearance, and texture.

SAMPLE SCORE CARDS

Bread Score Card I

Flavor	35
Lightness	15
Grain and texture	20
Crust — color, depth, texture	10
Crumb — color, moisture	10
Shape and size	10
Total	100

Bread Score Card II

Flavor	20
Doughiness and moisture	20
Texture and Grain	20
Lightness	15
Sweetness	10
Color	5
Crust	5
Shape and size	5
Total	100

Bread Score Card III

General Appearance	30
Texture	15
Color	15
Elasticity of crumb	10
Flavor	15
Odor	15
Total	100

Further Study of Yeast

I

Conditions which Affect the Growth of Yeast

Blend one-half a compressed yeast cake with a small amount of water, and add this to one cupful of a thin batter, made of equal parts of flour and water. Divide into four parts — A, B, C, and D.

1. Freeze A by surrounding the vessel that holds it with a mixture of equal parts of finely chopped ice and coarse salt. After the batter has been frozen hard for ten or more minutes, allow it to thaw; then set the vessel in a warm place, or place it in warm water, as in the recipes for bread, and see whether the yeast plant has retained its vitality.

2. Boil part B for 1 m., allow it to cool, place in a favorable temperature as before, and note whether or not the life of the plant has been destroyed by boiling.

3. Add to C one teaspoonful of common salt, and place the mixture in a favorable temperature for growth.

4. Keep D for a control test under favorable conditions from the start. Note in each case the amount of gas, if any, given off.

II

By-product of the Growth of Yeast

Fill a wide-mouthed bottle with a mixture of cane sugar and water, or glucose syrup and water, in the proportion of two tablespoonfuls of the syrup (or sugar) to a pint of water. Add one-quarter of a yeast cake, cover the bottle with a saucer, or a soup plate, and invert it.

When the gas has displaced the liquid in the bottle (it may take several hours, or overnight), test it by pouring some into a beaker filled with lime water, by pouring some on a lighted candle, etc.

III

Comparison of Dried and Compressed Yeast

Make a thin batter, using one cupful each of flour and water. Divide into two parts, A and B. Blend with A one-eighth cake of compressed yeast; blend with B one-eighth cake of dried yeast, previously softened in water. Place each mixture in a 100 cc. beaker, set these in a warm place, and observe: (*a*) in which the gas was first generated; (*b*) in which the action continued longest; (*c*) in which the total amount of gas generated was the greatest—as evidenced by the height to which the bubbles rose in the beaker.

TOPICS FOR STUDY OR DISCUSSION

1. Bacteria, yeasts, and molds; where found, how developed; various results of their life activities.
2. "Wild" yeasts; their action on food; how to obtain and utilize them. The "barms," the salt-rising breads, the ancient leavens.
3. Different phases of the life of the yeast plant—the active or growing state, the resting state, the dormant or spore state.
4. Cultivated yeasts—brewer's yeast, dried yeast, compressed yeast; methods of manufacturing these.
5. Fermented milk, koumiss, kephir, matzoon.
6. The chemical and physical changes in the making of bread; the chemical and physical changes in the baking of bread.
7. Varieties of bread—whole wheat, Graham, Vienna, etc. Aërated bread.

8. Breads of various countries — Danish and Norwegian breads, pumpernickel and other rye breads.

9. Antiquity of bread making; bread making in Egypt, in Rome, etc.

10. Historical associations of bread; the bakers gilds; the bread riots; laws regarding the making and sale of bread.

11. The bread-making industry of today. Sanitation of bakeries. Delivery conditions. Cost of bakers' as compared with home-made bread.

12. Adulterations of bread. Pure Food laws relating to bread.

13. Purchase of flour — in barrels, in bags, in small sacks, in quantities of one or more pounds.

14. Milling processes; the great flour mills and the characteristics of the flour produced by each.

QUESTIONS

1. Compare the nutritive value of a helping of cereal with that of a slice of bread. (See charts.)

2. Which cereals can be successfully used for bread making and which cannot? Why?

3. Why is it not best to use pastry flour in bread making?

4. Criticise the bread score cards on page 177. Construct a score card that might, in your judgment, be a better guide in judging bread.

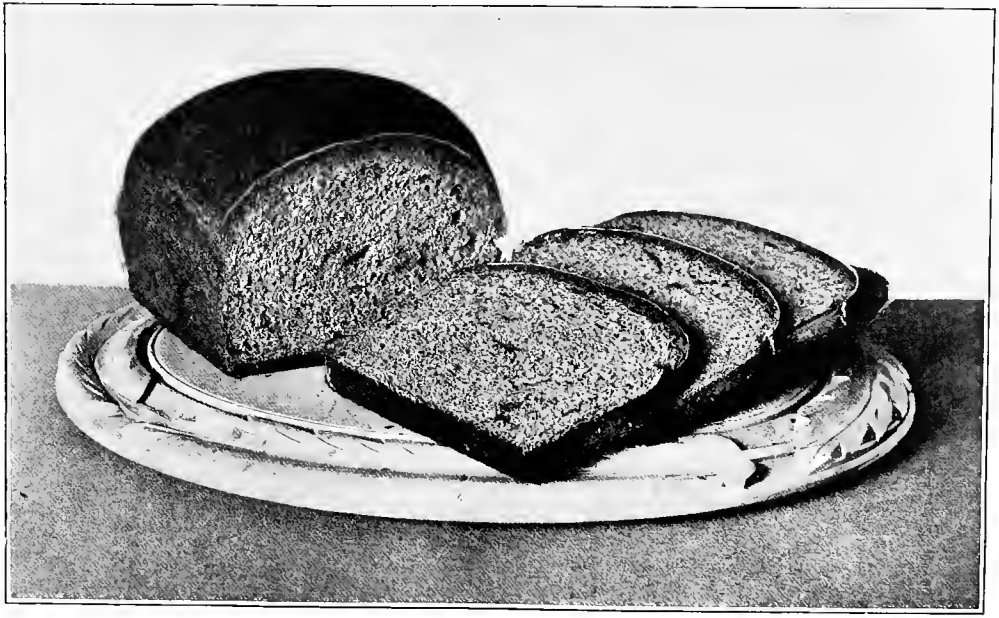
5. Name some labor-saving devices that are used in bread making. Discuss their value.

6. Compare the action of baking powder and of yeast in leavening flour mixtures.

7. Compare the economy of aërated and of yeast-raised bread. What is the proof that a certain amount of flour is lost in the latter process? To what is due the difference in flavor of the two kinds of bread?

8. Is more yeast, that is, a larger number of yeast cells, actually present in quick-process bread than in slow process?

9. Why is a smaller proportion of salt used in bread



WHOLE-WHEAT BREAD

making than in the other flour mixtures? Suggest a method of adding salt in the process of bread making that will minimize its effect on the growth of the yeast.

EXERCISES

1. The making of whole-wheat bread.

The other exercises on this subject may be chosen from the variations on the bread dough.

References

See references for Chapter XV, with the addition of

Conn. Bacteria, Yeasts, and Molds in the Home.

Snyder. Human Foods, Chap. XI.

Bulletins 67, 101, 126, U. S. Dept. of Agriculture, Office of Experiment Stations, and Farmers' Bulletin 112.

CHAPTER XVIII

SUGAR

To the Student. On referring to the charts, Appendix A, you will find that cane sugar is pure carbohydrate, mixed with no trace of any other food principle. It is thus the one food which may be said to be chemically pure. As a food, sugar has fallen into some disrepute, owing to the unwholesome effects following over-indulgence in sweets. Since, however, it is much easier to over-eat of expensive candies and bonbons, done up in costly boxes, than it is to over-eat of the purer home-made varieties, some recipes will be given in this chapter for simple candy that may be eaten without hurt, provided it is taken at the right time and in proper quantity. Incidentally there are many interesting principles to be learned regarding the cookery of sugar, for notwithstanding the certainty of its chemical composition it is one of the most uncertain substances to work with, and is always doing surprising things in the saucepans. An experienced cook says, "It has ways that are past finding out; it is so easily affected by the atmosphere."

STUDY OF SUGAR IN COOKING

Peanut Brittle

Ingredients. Equal parts of sugar and peanuts, roasted, shelled, and chopped.

Method. Cook the sugar over the fire in a shallow pan

until it turns into a clear, brown liquid. Stir it judiciously from the bottom up, while cooking. The lumps which will form may be pressed out with the back of the spoon — they should not cause uneasiness, since they are only one of the odd happenings that may be expected when dealing with sugar.

When the whole is melted to a clear, golden brown the peanuts should be added; the mixture is then stirred together and poured on a plate or a marble slab. A smooth plate or a slab need not be greased, as the peanut brittle will slip off in one sheet when cold. It may then be broken into pieces for eating.

Compare the peanut brittle with cane sugar as to sweetness, flavor, and texture. Save a portion of it for a test to be made later.

The basis for individual class work may be from one-quarter to one-half cup of sugar.

Almond Rock

The sugar is melted as for peanut brittle. Shelled and blanched almonds are placed in rows on a dish, lightly stuck on by drops of the melted sugar just as it begins to turn brown. The cooking of the sugar is continued until it is as brown as for peanut brittle; it is then poured over the almonds.

Glacé Nuts

Halves of shelled walnuts are dipped into sugar melted as for peanut brittle, but the nuts should be dipped before the sugar browns, or at farthest when it is barely beginning to turn. The dipped nuts are placed one by one on a very lightly greased slab or plate, until the sugar coating is hard. This confection should be made in

dry, clear weather. It should be used within two or three days at the utmost, since it is easily affected by the atmosphere.

Vanilla Fudge

Ingredients. Sugar and milk, in the proportions of three to one. A small amount of butter, perhaps one teaspoonful to every cup of sugar. Vanilla extract, or a bit of vanilla bean.

Method. Melt the butter in the bottom of the saucepan. Add the milk and sugar, stir until the mixture boils, then cook for about 15 m. without stirring. Remove from fire, add flavoring extract, beat until creamy, pour into lightly greased pans, and cut into squares with a greased knife as soon as it is hard enough. If vanilla bean is used for flavoring it should first be boiled in the milk for a few minutes. Chopped nuts can be added just before beating, if desired. Save a portion for a test to be made later.

Compare with cane sugar as to sweetness, flavor, texture.

Basis for class work: one-half to one cup of milk. Less time should be allowed for cooking a small quantity. Why?

Velvet Molasses Candy

Ingredients. Molasses and water in equal parts. Three times as much sugar as water, and one-fourth as much vinegar as water. About a tablespoonful of butter to every cup of sugar.

Method. First melt the butter in the saucepan, then add all the other ingredients, and boil until a spoonful of the mixture will form a firm ball when dropped into cold

water. Pour into a greased pan, and when cool enough to handle pull until white and firm. Save a portion for a test to be made later.

Compare with cane sugar as to sweetness, flavor, texture.

Basis for class work: one-half to one cup of sugar.

Fondants

Ingredients. Sugar, water, and cream of tartar or some acid substance. About twice as much sugar as water is a good proportion. Allow one-eighth of a teaspoonful of cream of tartar for two cups of sugar.

Method. Mix the sugar, water, and cream of tartar and let them stand for half an hour, if time permits. Put on to boil in an agate or other smooth-lined saucepan, and stir gently until the sugar is dissolved. Then cease the stirring, and from time to time wipe off with a damp cloth any crystals of sugar that have been thrown up against the sides of saucepan. A strip of cheesecloth, folded around the tines of a fork, will do this very nicely. Let the mixture boil for 10 m.; then try whether a spoonful dropped into cold water will form a soft ball. Continue to cook until the syrup has reached this stage; then pour it out on a shallow dish to cool quickly. In cooling it will harden so that the pressure of a finger-tip on the surface will make a dent, and when this stage is reached the mass should be worked from the edges to the center with a spatula until it is a white, glossy, creamy paste. As it hardens it can be kneaded like dough until firm. This can be used as a filling for bonbons, for chocolate creams, for creamed walnuts, nut bars, etc.

The fondant can be packed into a jar, covered with glazed paper, and kept in the refrigerator for future use.

If well made it should be white, glossy, and satiny in appearance, and should feel as smooth as lard when a bit is rubbed between thumb and forefinger. If it has "grained" it can be boiled over again in a small amount of water, and this process can be repeated, so long as the sugar does not burn, without hurt to the result other than that the fondant will turn slightly yellow.

Compare the relative sweetness of the fondant, the vanilla fudge, and the cane sugar. Compare the texture of fondant and cane sugar. Save a portion for a later test.

Experiments to Aid or Confirm Inferences

I

Comparison of Cane Sugar and Glucose

1. Compare the properties of cane sugar and commercial glucose as follows:

(*a*) Which has the more crystalline structure?

(*b*) Which is the easier dissolved in water?

(*c*) Which has the sweeter taste? (Note the relation between solubility and flavor in this and other substances.)

2. Set aside the solutions made in *b* for a few days to see whether crystallization will take place. Note shape and size of crystals where these are formed.

3. Determine what proportion of cane sugar will be held in solution by cold water, what proportion by boiling water. Use at least a half-cupful of water in each case.

4. Apply Trommer's test to solutions of cane sugar and glucose in the following manner. Place in two test tubes, A and B, about half an inch of sodium hydroxide solution. Add *one drop* of a solution of copper sulphate. Shake a little. Note change that has taken place. What substance is formed? Add to the two test tubes, respectively,

about a half-inch of (*a*) the cane sugar solution; (*b*) the solution of glucose, made in 1–*b*. By means of a paper strip, hold both test tubes at the same time over the gas flame and heat gently until one of the solutions just begins to change slightly in color. Remove from heat. You will find that the color will continue to change from the effect of the retained heat. What salt of copper is now present? What agent has caused the reduction?

II

Effect on Cane Sugar of Dry Heat

1. Brown a quarter-cupful of cane sugar as for making peanut brittle. As soon as a clear, golden-brown liquid is formed, pour on it, quickly and all at once, a quarter-cupful of water. Drain off the liquid *immediately*. Taste it. Taste the less soluble mass. The liquid, which should be a deep brown color, is caramel; the golden mass is known as barley sugar. Compare the sweetness of the barley sugar with that of cane sugar. Dissolve some of it in water, and set it aside for a day or two to see whether re-crystallization will take place. Have you any reason to infer that a chemical change has taken place in the cane sugar through the agency of heat?

Dissolve some of the peanut brittle in hot water and see whether it re-crystallizes from solution; whether the caramel present can be separated to any extent from the barley sugar.

III

Effect of Water and Heat

1. Boil a solution of one part cane sugar and three parts water in a flask or covered vessel for from one-half to one

hour, keeping up the quantity of water. Apply Trommer's test to small portions at the end of each twenty-minute period until a reducing sugar is found to be present.

2. Apply Trommer's test to a portion of the vanilla fudge.

IV

Effect of Water, Heat, and Acid

1. Boil a solution of one part cane sugar and three parts water as in III–1, after the addition of one-tenth of its volume of sulphuric acid. After 15 m. boiling, apply Trommer's test to small portions, and continue to test, at intervals of 5 m., until a reducing sugar is found to be present.

2. Apply Trommer's test to solutions of the velvet molasses candy and the fondant.

TOPICS FOR STUDY OR DISCUSSION

1. The sources of commercial sugar — the sugar cane, the sugar maple, the beet, etc.

2. The various steps in the manufacture of sugar; the different grades of sugar that result — brown, white, lump, powdered, etc.

3. The by-products of the manufacture of sugar, *e. g.*, molasses.

4. Classification of sugars — the monosaccharids or simple sugars; the disaccharids.

5. Sugar as an antiseptic. Sugar as an intestinal irritant.

6. Amount of sugar permitted in the diet. Factors which influence the digestion and assimilation of sugar.

7. Sugar in the diet of training; during physical exertion such as mountain climbing; in the army during long marches, etc.

8. Chemical changes in the cooking of sugar.
9. Sugar *vs.* fat as a source of energy.
10. Laws relating to the manufacture, adulteration, and sale of sugar. Imports and exports of sugar, etc.

QUESTIONS

1. Classify, according to their chemical composition, the following sugars and saccharine substances: cane sugar, milk sugar, maple sugar, honey, molasses.
2. Compare the cost of home-made and commercial candies of the same class, including the cost of fuel and labor for the home-made.
3. Discuss methods of apportioning the daily allowance of sugar in the diet so as to secure the wholesomest results.
4. Name familiar examples of the use of sugar as an antiseptic.
5. Compare sugar, fat, and gelatine as protein sparers.
6. Compare sugar, fat, and gelatine as energy givers.
7. Compare starch and sugar as protein sparers and energy givers.
8. Trace the connection between the experiments and the practical work of this chapter.

References

Bailey. Sanitary and Applied Chemistry, Chaps. XIV and XV.
Chittenden. The Nutrition of Man, Chap. II, and pp. 290–1. (Ed-1907.)
Church. Food, Part I.
Conn. Bacteria, Yeasts, and Molds in the Home, see Index.
Jordan. The Principles of Human Nutrition, Chap IV.
Hutchison. Food and Dietetics, Chap. XV.
Lassar-Cohn. Chemistry in Daily Life, Lecture IV.
Sherman. Chemistry of Food and Nutrition, see Index.
Snyder. Human Foods, Chap. V.
Thompson. Practical Dietetics, see Index.
Wiley. Foods and Food Adulterants, Part IX.
Farmers' Bulletin No. 93, U. S. Department of Agriculture: Sugar as Food.

CHAPTER XIX

BEVERAGES

To the Student. Coffee and tea contain a certain nerve-stimulating substance called caffeine. A similar substance, but one that is much milder in its action, theobromine, is found in cocoa and chocolate. These compounds may be regarded as quite near relatives — if not exactly sisters, surely first cousins — of that Borgian family which includes nicotine, strychnine, morphine, etc., in that they may all be traced back to the common ancestry of what chemists call the nitrogen heterocycles. This is something that need not trouble you until you study organic chemistry. It is sufficient for today to know that caffeine, as well as strychnine, if taken at the wrong time, or in excessive quantity, may work as a mischief-maker in the system. It is the opinion of many persons that the wrong time to take coffee or tea (the caffeine-containing beverages) is any day before one's thirtieth birthday, and that excessive quantity is anything more than one cup at breakfast time. But this one cup of coffee, if well made, is tolerated by most persons of adult age.

Besides the nerve-stimulants just mentioned, tea, coffee, and chocolate contain tannin, an astringent substance which is found in most fruits and vegetables.

In the methods of making coffee that follow, the same brand of coffee should be used, since it will be interesting to note the different results from different ways of making.

FOUR WAYS OF MAKING COFFEE

1. Cold-Process Coffee

Proportions. Four ounces of coffee to one pint of water.

Method. Mix the coffee thoroughly with cold water. Let it stand eight to ten hours, or overnight. Decant the liquid carefully, heat until it boils, and serve.

Coffee made in this way is said to be less hurtful than when made by the more usual methods.

2. Boiled Coffee with Cold Water

Proportions. Two ounces of coffee to one pint of water.

Method. Mix one or two spoonfuls of beaten egg with one-half cup of cold water — or one or two crushed egg-shells may be substituted for the beaten egg. (See notes following recipes.) Add the remainder of the water, and heat very slowly to boiling. Let boil for 3 m.; then draw aside from the heat and allow to settle for 5 m. before serving.

3. Boiled Coffee with Boiling Water

Proportions. Two ounces of coffee to one pint of water.

Method. Mix the dry coffee with beaten egg and cold water as in 2. Add freshly boiling water, let it boil for 5 m., draw aside to settle as in 2, and serve.

4. Filtered or "Drip" Coffee

Proportions. Four ounces of coffee to one pint of water.

Method. Place the coffee in the strainer, or the upper part of the coffeepot. Stand the coffeepot in a pan of hot water. Add the boiling water to the coffee, one-fourth at a time, at intervals of 1 m. Cover the pot be-

tween the additions of water. The coffee, if not strong enough, may be re-filtered.

This is sometimes called French coffee, and is served for after-dinner coffee. A better result may be obtained by the use of a percolater, where the boiling water in the lower part of the pot is made to squirt out over the ground coffee in the upper part, filter through it, and drip into the lower part again, and the process may be kept up until the coffee is the desired strength without any fear that it will grow cold.

NOTES. It is said that the flavor of the beverage is improved if the dry, ground coffee is heated in the oven for a few minutes before adding the water.

A very small amount of salt, one-quarter teaspoonful to a cup of water, is also said to improve very much the flavor of the coffee. The taste of the salt will not be apparent in so small quantity.

One raw egg is sufficient to clear one cup of ground coffee. Clean eggshells, for the sake of the albumen which adheres to them, may be substituted for the egg — when these are at hand — for the sake of economy. Or a square inch of isinglass, or dried fish skin, or one of the patent coffee settlers, can also be substituted for the egg. Or a skillful coffee maker can make good clear coffee without any such aid.

A perfectly clean coffeepot, free from the odor of the coffee of the day before, is another important factor in good coffee making. To this end, after scrupulous washing of the pot it should be put away on the shelf with the lid open until needed for use.

TEA

Freshly boiling water is invariably prescribed for making tea, but since there is often carelessness in carrying out this direction, it may be well to state that by *freshly* boiling is meant water that has just boiled for the first time, not water that has continued to boil for perhaps half an hour, nor water that has boiled and cooled and been boiled again for several times. And by freshly *boiling* is meant water that is actually boiling at the time of tea-making, not water that has been boiling a few minutes ago and been set aside.

To Make Tea

Method 1. Allow one rounded teaspoonful of tea for every cup of water. Put the tea into the teapot, pour on the freshly boiling water, and set the pot where the beverage will keep hot, but *not boil*, for 5 m. — no longer. It can then be served from the pot, or strained from the leaves into a clean, thoroughly heated pot, since if the serving time is prolonged the tea acquires a bitter taste from standing on the leaves.

A CUP OF TEA

Method 2. Proceed as before, and after the hot water has been added to the tea, cover the pot closely with a tea cozy, and let it stand for 10 m. to "draw" before serving.

Method 3. Put the tea into a tea ball, or one of the open tea strainers, pour the water into the cup, and dip the ball up and down in the water until the color indicates the strength desired. If a tea strainer is used the strainer is held over each cup and the water poured through.

Compare the flavor of the tea made in different ways.

Cocoa I

Ingredients. Cocoa, sugar, water, salt, and milk.

Proportions. Twice as much sugar as cocoa, twice as much water as sugar, one tablespoonful of cocoa to every cup of milk, one-quarter teaspoonful of salt to every cup of milk. When more than a pint of cocoa is to be made, the proportion of water should be diminished, no more being required than will make a paste after a few minutes' boiling.

Method. Cook the cocoa, sugar, water, and salt, stirring constantly, until the spoon leaves a track in the mixture. Add the milk, and let the whole boil for a minute. Decrease the temperature, and beat the mixture with a Dover beater until a thick froth forms on the top.

Make on the basis of one tablespoonful of cocoa.

Cocoa II

Proceed as before, omitting the salt, and omitting the final beating. Compare the flavor of the two.

Cocoa III

Proceed by the directions on the can of cocoa.

Compare the flavor of the cocoa made by the different methods, and account for the differences. Compare the cost. Decide which method you prefer. It is very much a matter of individual taste.

NOTE. Cream may be substituted for one-half the milk in making cocoa, if it is desired to enrich it.

Spanish Chocolate I

Ingredients. Chocolate, sugar, water, salt, milk, eggs.

Proportions. Twice as much sugar as chocolate. As much water as sugar. One cup of milk and one egg to every ounce of chocolate. One-quarter of a teaspoonful of salt to every cup of milk.

Method. Break the chocolate into little bits and cook with the water, sugar, and salt until a paste is formed as in Cocoa I. Add the milk, let the whole boil for a minute, have ready the eggs, stiffly beaten, and turn them quickly into the hot chocolate, beating vigorously all the while with a Dover beater. This dish will be more successful if one person turns in the eggs while the other beats, but a rapid worker can manage both operations. The essential point is that the eggs shall be beaten into the mixture before they have time to coagulate in lumps. The chocolate when finished should be very thick but smooth in consistency.

Make on the basis of two squares (ounces) of chocolate.

Spanish Chocolate II

Ingredients and proportions the same as before. Method the same, except that in this case the chocolate is to be quickly poured on to the beaten eggs in a bowl, while the mixture is vigorously beaten as before with a Dover beater.

Compare the flavor of the two. Which do you like best? Account for the difference. (Recall the conclusions you formed regarding the effect of initial high temperature on eggs, Chapter V, page 34). In which method of making the Spanish chocolate is it easier to avoid curdling the eggs?

FRUIT DRINKS

Fruit Punch

Ingredients and method. Equal parts of shredded pineapple, strawberries, and red currants. Cook until soft in half their volume of water, strain, sweeten, and when cold dilute to taste with water or Apollinaris, and serve in glasses half filled with shaved ice.

Apple Tea

Ingredients. Ten sour apples, two quarts of water, four tablespoonfuls of sago, the juice of two lemons, sugar to taste — or from one to two cups of sugar.

Method. Wipe and chop the apples, and cook in water until tender. Strain, add the sago, cook again until slightly thickened, sweeten, chill, add lemon juice, and serve.

Tea Punch

Ingredients.

½ cup boiling water.
1 cup sugar.
½ cup dry tea.
1 cup strawberry pulp.
½ cup lemon juice.
1 cup orange juice.
1 cup grated pineapple.
1 quart ice water.

Method. Mix the ingredients in the order given. Let stand for 15–20 m., strain, chill, and serve in tall glasses with a candied cherry in each glass. Or the mixture may be poured over a block of ice in a punch bowl and a quart of Apollinaris added before serving.

Experiments to Aid or Confirm Inferences

Tannin: Its Presence and its Effects

I

Presence of Tannin

Into eight test tubes pour about one inch of the following, respectively:

Grape juice.
Apple juice or cider, or cider vinegar.
Blackberry juice, diluted with water.
Infusion of tea in cold water } the solutions to be of equal
Infusion of tea in hot water } strength.
Infusion of coffee in cold water } the solutions to be of equal
Infusion of coffee in hot water } strength.
Solution of cocoa.

Add to each test tube a few drops of a solution of iron chloride or any soluble salt of iron. A black color or precipitate indicates the presence of tannin.

II

Effect of Tannin

Into six test tubes pour about an inch of the following, respectively:

Hydrated and dissolved gelatine.
White of egg.
A solution of Liebig's extract.
A solution of pepsin.
A solution of pancreatine.
Some clear saliva.

Add to each test tube a few drops of a strong solution of tannin. Note in which cases, and to what extent, precipitation takes place. Determine by the use of Millon's reagent whether protein bodies are present in the solutions of pepsin and pancreatine, and in the saliva. Millon's reagent is the test used to demonstrate the presence of small amounts of proteid in any substance.

TOPICS FOR STUDY OR DISCUSSION

1. The history of tea, coffee, and chocolate.
2. The chief varieties of coffee; the great coffee plantations of the world; the manufacturing processes used in the preparation of coffee for the market.
3. The chief tea-producing countries. The effect on tea of climate, soil, and method of manufacture.
4. Cocoa, and the by-products of its manufacture — cocoa shells, cocoa butter, etc.
5. The chemical composition of coffee, tea, and chocolate. The difference between the cocoa and chocolate of commerce.
6. The effect on digestion of tea, coffee, and cocoa. The effect of these beverages on the nerves.
7. Common adulterants of tea, coffee, and chocolate. Food laws relating to these substances.
8. Races and nations which favor the use of each of the beverages studied.

QUESTIONS

1. Which of the substances tested in Experiment I do you infer contains the largest amount of tannin? Which the smallest?
2. What fallacy is involved in prohibiting the use of tea and coffee and permitting the use of grape juice, blackberries, etc., in the diet?
3. On what grounds might tea and coffee be forbidden and other foods containing tannin be allowed?
4. Has the method of making tea and coffee any effect on the amount of tannin extracted?
5. Which would be easier of digestion, a gelatine jelly flavored with coffee, or one flavored with orange juice? Why? What is the effect of tannin on protein foods? on the digestive juices?
6. Compare the effect of drinking tea or coffee at the beginning of a meal, during the meal, or at its close.
7. What do you think was the cause of the discoloration of the potato in the work of Chapter II, page 10?

References

Bailey. Sanitary and Applied Chemistry, Chap. XXII.
Church. Food, Part IV.
Hutchison. Food and Dietetics, Chap. XVIII.
Lassar-Cohn. Chemistry in Daily Life, see Index.
Lusk. The Science of Nutrition, see Index.
Snyder. Human Foods, Chap. XIV.
Thompson. Food and Dietetics, see Index.

CHAPTER XX

CAKES, PIES, AND PUDDINGS

To the Student. It has been said that there is really no need to include a lesson on cake making in a formal course of instruction, for whether they are taught or not, girls will naturally make cake, and the principles involved can be taught by means of those more prosaic and every-day dishes which are far more important in the daily diet.

This lesson, then, may be omitted, or if it is included may be used as an exercise in originality, since no recipe, but general instructions only, will be given.

There are two great classes of cakes — those made with butter or other shortening, and those made without. The first is the more important class, in that it is the larger, and it includes the greater variety. The standard or type form of this class, from which ever so many other cakes can be derived, is the old-fashioned one called the " one-two-three-four " cake, so named because one (part) of butter, two of sugar, three of flour, and four eggs are called for in the orthodox recipe. Experienced cake makers have called this the " mother of cakes."

A diagrammatic representation of this standard mixture is given on page 202. This shows how variety may be introduced, and it illustrates the wide scope for individual taste that is afforded in the various kinds and amounts of ingredients that may be used.

An explanation of the diagram will follow.

NOTE. For every cup of nuts, when nuts are used, one-quarter teaspoonful of salt should be added to the cake mixture. This will

bring out the flavor of the nuts in such a way as greatly to add to the deliciousness of the cake.

Likewise, when nuts are used, one-quarter cup of butter should be subtracted from the maximum amount, since nuts are rich in fat, and an excess of this will cause the cake to fall.

When chocolate is used, one-half ounce of butter should be subtracted from the maximum amount, since chocolate contains nearly half its weight of fat.

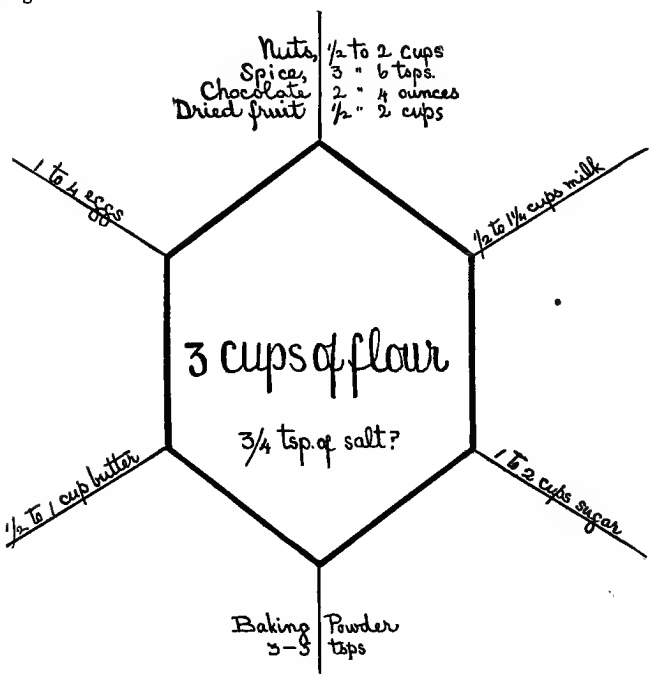


DIAGRAM OF CAKE MAKING

EXPLANATION OF THE DIAGRAM

The three cups of flour are here taken as the standard and unalterable quantity, since the proportion of all the other ingredients may vary according to circumstances.

Even the amount of flour may vary, according to its thickening property, as shown in the work in preceding chapters. But it is in this case assumed to be constant, and all the other ingredients are allowed for on the basis of this quantity.

A question mark follows the prescribed amount of salt, since if salted butter is used this may be omitted or lessened.

Extending from the angles of the hexagon to right and left are the minimum and maximum quantities of eggs, milk, butter, and sugar. The eggs and milk, taken together, should equal one and one-half cups of liquid, according to the rules for the thick batter given on page 146; thus, the smaller the number of eggs the larger will be the amount of milk used. The baking powder will similarly be used in larger quantity if the number of eggs is fewer.

The optional ingredients, given at the upper part of the figure, afford opportunity for still greater variety according to the quantity used and the various combinations that may be made, such as nuts and spice, nuts and chocolate, nuts and fruit, or nuts and spice and fruit, or nuts and chocolate and fruit. Where a combination of two or more of these is used the volume of the mixture had better not exceed two cups.

Standard Method of Mixing

Cream the butter until it is white and satiny and may be beaten with a spoon. Add the sugar, and mix this in thoroughly. Add the stiffly-beaten eggs, then the flour (sifted with the salt and baking powder), alternately with the milk, being careful to add only a very little of

the milk at a time, so as to avoid curdling the batter and spoiling the grain of the cake.

VARIETIES IN METHODS OF MIXING

Eggs may be added by:

1. Beating stiff, adding to the milk, and using the mixture for wetting.
2. Adding the beaten yolks to the creamed butter and sugar; adding the stiffly-beaten whites the last thing to the batter.
3. Adding the whole egg, unbeaten, to the creamed butter and sugar.

Butter may be added by:

1. Rubbing it into the flour until thoroughly well mixed.
2. Melting, and adding it the last thing to the batter.
3. Chopping it lightly into the dry mixture.

Fruit may be added by:

1. Flouring the fruit and adding it the last thing to the batter, or just before the stiffly-beaten whites of eggs, if eggs are added by Method 2.
2. Adding the fruit directly to the creamed butter, and mixing well.
3. Heating the fruit until well plumped up, and adding as in 1.

Other varieties in the general method are: (1) adding the baking powder by stirring it into the batter just before this goes into the baking pan; (2) putting all the ingredients together into a bowl, the butter being just softened, and beating them all up at once until a fine-textured batter results. This last method needs for success either a patent cake mixer or a strong arm.

PIES

General Rules for Making Pies

1. When the filling of the pie is uncooked, the pastry and the filling are baked together.

2. Pies made with a cooked filling are best when the crust, or shell, is previously baked.

3. When a pie is made of very juicy fruit its under crust should be brushed over with white of egg, to prevent sogginess, and a little flour should be added to the filling, two tablespoonfuls to every cup of sugar used as sweetening, to absorb excess of moisture.

4. When the skins are retained on the fruit for a pie, or when other forms of tough cellulose are present, the sugar should be added last. (Why?) In this case the filling is very often cooked, and then Rule 2 should be observed.

5. If a large amount of flour or starchy substance is used for the filling, this must be cooked before it goes into the pastry shell.

6. Eggs may be substituted for flour, or flour for eggs, as thickening for the filling, or a mixture of both may be used for thickening.

NOTE. One cup of flour will make upper and under crusts for a good-sized pie; six tablespoonfuls will be enough for an individual pie 5–6 inches in diameter.

EXAMPLES

Apple Pie

Make a plain pie crust (see Chapter XVI, page 157), cut out the upper crust by inverting the pie plate on the sheet of pastry and cutting a circle from this at least one-half inch larger than the circumference of the pie

plate. Line the pie plate with the remainder of the paste, and proceed as follows:

Allow four or five good-sized apples for a pie about as large as a dinner plate. Wash the apples, divide into eighths or quarters, core, and pare. Cut the sections into thin slices, arrange these in the lined pie plate in layers, and sprinkle with sugar, allowing one to two tablespoonfuls of sugar for each apple. Add a few cloves, or a little ground cinnamon, or nutmeg. Fill the apples well in toward the rim of the pie plate. Moisten the edges of the under crust with water before covering the pie with the upper crust. Slits or openings of any preferred shape should be cut in the upper crust before the pie is baked, to allow for the escape of steam. These may be made either before or after the upper crust is adjusted — it is easier to put the crust on the pie before the openings are made; it is easier to arrange the slits in some symmetrical design before the crust is put on. The two crusts should be pressed together lightly but firmly at the edges.

Pastry should be baked in a very hot oven for the first half of the time; afterwards with gradually decreasing heat.

NOTE. Bits of butter are sometimes put on the apples before the top crust goes on, to enrich the filling.

Some cooks bake the apples without sugar, and after the pie is done, and while still hot, lift the upper crust and add the sweetening.

The capacity of a pie plate may be enlarged by a process that is called building up the rim. Narrow strips of paste are cut and placed on the edge of the under crust, previously moistened, before the pie plate is filled. One, two, or more strips can be thus built up into a little ridge, deepening the cavity of the plate, so that a thick, generous pie can be made.

Strawberry Pie

Prepare the pastry as for apple pie, and arrange the under crust in the pie plate. Hull and wash the berries. Measure as much of the berries as will fill the pie plate,

and measure half as much sugar as berries. Mix the sugar thoroughly with one-fourth its volume of flour. Brush the bottom crust over with white of egg, and fill the pie plate with alternate layers of berries and sugar. Put on the top crust, and bake.

NOTE. Instead of a top crust, strips of pastry about half an inch wide may be crossed over the top and moistened and pressed down where they touch the under crust. This may be said to be a compromise between a one-crust and a two-crust pie.

Cranberry Pie

Before putting in the under crust, measure water nearly to fill the pie plate. Measure as much cranberries as water, half as much raisins as cranberries, and as much sugar as raisins. Take two tablespoonfuls of flour for every cup of water.

Cook flour, butter, and water as for medium white sauce (see Chapter II, page 9). Add the cranberries and the raisins (stoned), and cook together until the raisins are soft. Remove from fire and add sugar. Pour the mixture into the pastry shell, which should have been previously baked.

NOTE. Figs are a delicious substitute for raisins in a cranberry pie; or cranberries alone may be used.

To Bake a Pastry Shell. Line the pie plate as usual. Place a piece of cheesecloth over the pastry, and on it enough flour, cornmeal, or similar substance to keep the pastry from losing its shape. Bake until the crust is brown and crisp on the under side.

Another way is to invert a pie plate, and cover it with the pastry, fitting it smoothly on. Invert a second pie plate over this, laying it on lightly, and bake quickly in a hot oven until the crust is brown. The shell can then

be slipped off and fitted into its proper place in the pie plate.

Yet a third way is to fit the crust into the pie plate, and prick it all over with a fork before baking. This is the simplest method, but the pastry will not be so light, and the holes in the bottom may allow the juice to leak out. It can be used where the filling is not over moist.

Raisin Pie

Sometimes called Mock Mince Pie. Measure water in the pie plate, as for the cranberry pie. Take one-half as much raisins as water, one-eighth as much sugar as raisins, and one-half as much molasses as sugar. Allow one egg, one tablespoonful of lemon juice, and one teaspoonful of mixed spice for every cup of water used.

Stone and chop the raisins, and cook them in the water until soft. Add sugar, molasses, and spice. Remove from fire, cool slightly, then stir in, first the beaten eggs, then the lemon juice. Pour into pastry shell, and cover with the top crust, or with strips of pastry.

Lemon Pie

Measure water as before. Take half as much sugar as water, half as much flour as sugar, and half as much lemon juice as flour. Allow one egg for every cup of water used, or one egg to a small pie; two or three to a large one.

Heat the water. Mix the flour and sugar thoroughly, stir into the water, and cook, stirring constantly until the mixture boils. Remove from the fire, and very rapidly stir in the egg yolk. Add the lemon juice, and pour into the well-browned pastry shell. Cover the top with a meringue made from the whites of the eggs (see Chapter V, page 33). This may be browned in the oven, or under a gas

flame, or by holding a hot stove lid, or a heated salamander over it.

NOTE. When the egg is added the mixture should be warm enough to coagulate it sufficiently to thicken the whole, but not hot enough to cause curdling. The filling made in this way should cut firm when cold.

PUDDINGS

To the Student. The foundation for several classes of puddings will be given, with merely a hint as to how the pudding is made. This will be a fine opportunity to use initiative and originality and to make some delicious pudding not just like everybody's else.

FOUNDATIONS FOR PUDDINGS

Foundation 1. A thick batter. The batter is sweetened, enriched by eggs and butter; and fruit, either fresh or dried, spices, etc., may be added. Suet may be substituted for butter, or molasses for sugar. Steam one hour for every cup or fraction of a cup of flour.

Foundation 2. A soft dough. The dough should be very light, and may be used in several ways: (*a*) Spread with fresh fruit or preserves, rolled up like a jelly-roll, and steamed, baked, or sometimes boiled. (*b*) Apples, cored and pared, or other fruit may be inclosed in individual portions of the dough, and boiled, baked, or steamed. These are called dumplings. (*c*) Fresh fruit may be cooked in a deep dish, a sheet of biscuit dough on top, and the whole baked until the crust is brown.

Foundation 3. Bread crumbs. Rolled and sifted crumbs are substituted for flour, and the baking powder measured as usual. The wetting should have a large proportion of egg. Fruit, sugar, etc., as for the puddings made on Foundation 1, may be added.

The English Plum Pudding is made on a foundation of bread crumbs, but for this the bread should not be stale, and should be rubbed to crumbs rather than grated. An equal weight of every ingredient is taken, *i. e.*, crumbs, finely-chopped suet, eggs, raisins, and currants. Candied peel and spices, in any desired quantity, are also used.

This pudding, made on the basis of one pound of crumbs, with the other ingredients in proportion, will require from six to eight hours to boil — the longer rather than the shorter time being preferable.

Foundation 4. Cereal. Proceed as for batter puddings, Foundation 1. Cooked, or left-over cereal, gives excellent results, but the uncooked grains, such as corn meal, pettijohn, etc., may be used, and also the ready-prepared forms, such as corn flakes, etc.

Foundation 5. A chou paste (see Chapter XVI, pages 163-5). Substitute milk for water, bake in individual cups, and serve hot, in the baking cups, with a rich sauce.

Foundation 6. Cake or bread. These may be used in the following ways: (*a*) Cut stale cake into slices, arrange in layers in a baking dish, alternating with fruit, pour a custard mixture over all, and bake. (*b*) Spread slices of bread with butter, place in a baking dish with the buttered side down, pour a custard mixture over, and bake. (See Bread and Butter Pudding, Chapter XII, page 107.) (*c*) Make a light cake mixture, bake, cut in slices, and serve while hot with a well-flavored sauce. This is called Cottage Pudding.

Foundation 7. A thick sauce, using flour and liquid in the proportions for a thick white sauce. (See Chapter XII, page 110.) (*a*) Use fruit juice for the liquid, and either flour, cornstarch, or arrowroot for the thickening. (For proportions of these, see results of experiments, Chapter XIV,

Exercise 3.) Eggs may be used to enrich the pudding, or to make it lighter and more spongy. (See Chapter XV, page 143.) (*b*) Make a rich, thick white sauce, using flour, butter, and milk. Sweeten and flavor. Stir in the beaten yolks of four eggs for every cupful of milk used in making the sauce, then beat into the warm mixture the stiffly-beaten whites of the eggs. Bake in a slightly-greased pudding dish for from one-half to three-quarters of an hour. Observe the same rules for the care of the oven given for the baking of popovers (Chapter XV, page 145).

To Boil Puddings

Method 1. The pudding is tied in a cloth wrung out of hot water and then well dredged with flour. Room is allowed for swelling. The bag thus made, containing the pudding mixture, is dropped into rapidly boiling water and boiled continuously until cooked, the amount of water being kept up as it is reduced by evaporation. A thick stoneware plate in the bottom of the kettle will keep the pudding bag from adhering to the hot metal, and possibly burning.

Method 2. The pudding is poured into a well-greased bowl or other mold, and a floured cloth is tied over this. Bowl and all are dropped into boiling water and cooked as in 1.

Method 3. The pudding is poured into a well-greased pudding tin, or other mold. This is covered with oiled paper and set into a kettle of boiling water, which is covered and kept over the fire until the pudding is cooked.

NOTE. All boiled puddings may be steamed with equally good results.

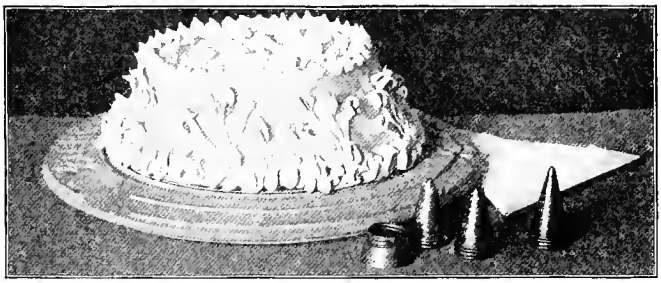
QUESTIONS

1. What rules for the making of pies were illustrated in each of the recipes for pies given in this chapter?
2. Which method of cooking — boiling, baking, or steaming — could best be used for each of the seven classes of puddings, or for any variation within each class?
3. Name the chief principles of the preparation of food that were demonstrated in making one particular dish of each of the three kinds — cake, pie, or pudding — described in this chapter.

EXERCISES

1. Construct an original cake mixture on the basis of the 1–2–3–4 cake.
2. Make any one of the following pies, illustrating thereby some definite rule or rules for the making of pies: orange cream pie, orange meringue pie, nut custard pie, cherry pie, fig pie, sweet potato pie, squash pie.
3. Make a pudding on any one of the "Foundations" you prefer.
4. Frost a cake and decorate it, imitating the illustrations that follow.

CAKE COVERED WITH CONFECTIONER'S FROSTING, READY TO ORNAMENT



CAKE DECORATED WITH ORNAMENTAL FROSTING

Tubes used: leaf, star, and small cord; shank on which tubes can be screwed; paper folded and cut same as leaf tube.

CHAPTER XXI

APPETITE-JUICE. THE VITAMINES

To the Student. All your study of the principles of the preparation of food can have but one end-point — to enable you to preserve the nutrition and to enhance the flavor of the foods served for the daily meals. Now that you have mastered these principles it is time to take the step for which they have prepared you, and to study the essentials in the diet according to the light of the most recent knowledge, as a guide in the correct combination of foods.

Many of the principles studied in preceding chapters have dealt with the preservation of flavor, with the art of making things taste good. There is a reason for this apart from gratification of the palate, for that foods shall be relished is now one of the acknowledged essentials in diet. We shall therefore open this chapter with a discussion of Appetite-Juice.

Appetite-Juice

Scientists have discovered that the gastric juice varies according to the food it is called upon to digest. We used to think of the gastric juice as composed of certain substances mixed in definite and practically constant proportion. We knew that it varied according to health, perhaps according to age, but we did not think it varied from meal to meal, or from one part of the meal to another; nor, still less, did we think that it changed for every kind of food it had to digest. Yet this is ex-

actly what happens. When milk enters the stomach the right proportions of pepsin, acid, and other things in the proper quantity for the digestion of milk, are secreted; when meat has to be digested, the right proportions for meat are produced; and so on. But when something which is extremely appetizing and greatly relished — something which causes anticipatory mouth-watering — when a thing of this kind is eaten, or even seen or smelled, a kind of juice is secreted which is so powerful that it can digest practically anything. This has been called by its discoverer, Ivan Petrovitch Pavlov, "Appetit-Jus" or appetite-juice. It is of psychic origin, and will digest not only the food which stimulated its secretion, but the other foods at the same meal.

Now it will be seen how important it is that the flavor of every food should be made as good as possible in its preparation. Now it will be seen that a delicious dessert is rather a necessity than a luxury, and the less appetizing the main dish of the dinner, the more delicious should be the dessert, if we would not lose the nutriment of the less psychically interesting food which preceded it.

A classic experiment was once conducted in which the subjects, young men in vigorous health, were fed with nutritious but unrelished food for several days. They had to exercise a high degree of will power to eat this food, but so long as they were able to force themselves to swallow it, it was well digested. But the time soon came when the effort to eat became greater, and the amount they could compel themselves to eat became less, according to what scientists call the *law of diminishing returns*. Nature rebelled, and refused to allow this kind of forcible feeding, so the men had finally to discontinue the experiment.

The only conclusions to be drawn from the experiment are, that the will, strongly directed, can control the nerves — but only to a certain point; and not all persons may be depended on as capable of exerting such a high degree of will power as these picked and chosen subjects of the experiment. In case of necessity, where nothing but distasteful food can be procured, it may be well to force oneself to eat it; but invalids, persons of delicate or sensitive organization, and particularly children, should not be urged to make the effort, nor should outward force or compulsion ever be employed to compel any one to eat food that is excessively disliked. The more the food is relished, provided it is wholesome, the better it will be digested and assimilated.

To the Student. Since this book was first published there has been a revolution in the science of dietetics, due to the ever increasing importance of the vitamine content of food. No study of food is now complete — no study of food is worth the time spent on it — which does not include these important substances.

The Vitamines

The name " vitamine " is only half correct. The first part of the word, the vital part of it, is right — inasmuch as the vitamines are necessary to life, health, growth, and normal functioning of the body, they are of vital importance. But the second part, " amine " or amide, is wrong, for it has been proven that these wonderful and mysterious substances are in no sense amides. Scientists are now inclined to drop the name vitamine and to use fat-soluble A, or water-soluble B or C instead; nevertheless, however incorrect, the word vitamine has

probably come to stay, and will continue to be popularly used.

What are the Vitamines? The answer to this question can be arrived at only by exclusion. So far as we know, the vitamines are not organic salts, nor enzymes, nor ferments, nor bacteria. They elude chemical analysis; they elude microscopic examination; they have not been shown to possess calorific value; nor has the capacity for reproduction, which is one of the signs of life, been found in them. The only test for their presence is the biological one, and biology answers the question by stating that they are substances in food which are needed for life and health. Perhaps they may be compared to the soul of the food, since food without them is dead.

Where are the Vitamines Found? They are found in all foods in a natural state; that is, foods which have not been cooked, preserved, or subjected to commercial manufacturing processes of such a kind as to destroy or remove them. Three different kinds of vitamines have up to the present been distinguished. One of them is soluble in fat, and is known as "fat-soluble A." Both of the other kinds are soluble in water, and are known respectively as "water-soluble B" and "water-soluble C." The fat-soluble vitamine is found in the fat of milk, and in derivatives of milk rich in this fat, such as butter, cream, and the cheeses made from whole milk, or a mixture of milk and cream. It is also present in the yolk of eggs, in the fat fish such as herring, mackerel, etc., as well as in cod-liver oil. Glandular organs of animals, such as liver and kidneys, contain a good amount of it, as, curiously enough, do lettuce and other greens.

The water-soluble B is found more abundantly in nature than either of the other two, and is present in

almost all fresh foods, whether animal or vegetable. Yeast is particularly rich in the B vitamine, so are eggs, milk, and fresh vegetables.

The presence of water-soluble C has not been found so easy to distinguish, since both B and C are soluble in the same medium and frequently occur in the same foods. The citrus fruits are rich in C, so are cabbage, tomatoes, onions, and the sprouted or germinated legumes and grains. It is also found, though to a less extent, in some of the animal foods in an uncooked state.

What is the Function of the Vitamines? Fat-soluble A is necessary both for growth in children and the preservation of health in adults. Rickets in children is thought to occur from a lack of A in the diet; also xerophthalmia (a disease of the eyes) in both adults and children; and it is believed that the edema from which soldiers suffered during the war was due to absence or insufficiency of this vitamine. In experiments on animals it has been found that mammals deprived of A are incapable of growth, of bringing forth or suckling their young, or of attaining normal health and vigor; its deprivation results in death, and an insufficiency shortens their lives. In general, the condition of being under par may often be attributed to deficiency of this vitamine in the diet.

Water-soluble B is also needed for growth; it is anti-neuritic; and beri-beri, if not many other of the deficiency diseases, result from its absence. This vitamine is also believed to improve or restore the appetite.

Water-soluble C is antiscorbutic, and is believed to be necessary in the diet as a preventive of scurvy.

How may a Loss of Vitamines be Avoided? The fat-soluble A is lost through the milling processes, which deprive the grains of the germ. It is not present to any

appreciable extent in skimmed milk, or in cheese made from skimmed milk. It occurs directly beneath the outside skin of potatoes, and is lost if potatoes are pared, either before or after cooking.

Water-soluble B is for the most part lost through exposure of foods to very high temperature, though it withstands the ordinary temperatures employed in home cooking. When foods are cooked in water and the water thrown away, much if not most of this vitamine is lost. The use of alkalis in cooking, such as soda in cooking cabbage, beans, tomatoes, etc., cause a loss of this vitamine, but acids tend to preserve it. It is present in bran, and is lost when this is removed in milling.

Water-soluble C is very sensitive to heat and does not stand much cooking. Dried foods, even when a low temperature is employed, suffer an almost total loss of C, and in most cases of B.

CHAPTER XXII

THE MINERALS. ACID- AND ALKALI-FORMING FOODS

To the Student. The fact that we cannot see, smell, touch, or often taste the mineral salts in our diet has in times past resulted in the belief that they were of secondary importance, and that their presence may be taken for granted, both as regards kinds and amounts. But later study has proved the minerals in our diet to be as necessary to life as water, as necessary to growth and health as protein; for if a diet is provided which is rich in all other essentials but is free from minerals it will be found unable to sustain life. Neither may their presence be taken for granted, for much of our highly manufactured food is without certain important minerals, which the body must lack unless provision is made for them.

Certain necessary information regarding minerals, brought up to date according to recognized authorities, is condensed in the following sections.

Minerals Needed in the Diet

For the maintenance of health the body needs the following minerals, in quantities varying in descending scale according to their order in the list:

Calcium	Magnesium	
Phosphorus	Iron	
Potassium	Iodine	in very small quantities
Sulphur	Fluorine	
Sodium	Silicon	
Chlorine		

Most of these may be assumed to be present in the average diet, with three important exceptions, viz.: calcium, phosphorus, and iron. So far as these three are concerned scientists tell us we are too near the danger-point of mineral starvation to allow us to plan our diet with special regard to supplying them.

The Function of the Minerals in General

1. The minerals when in solution will readily pass through animal membranes by virtue of the property of osmosis. Osmosis means the intermingling of fluids of different densities when divided by an animal membrane. During digestion all foods are rendered fluid, and they pass into the blood, thence into the other tissues of the body, by the process of osmosis; thus, and only thus, are they enabled to nourish the body.

Two kinds of dissolved substances in this manner seek entrance to the various parts and tissues of the body: (1) the minerals, which are crystalline substances, and readily pass through the membranes; (2) and the non-minerals, which are known as colloids, that is, substances which are not crystals, and which seem to pass only very slowly and with difficulty through animal membranes, unless they are mixed with or accompanied by crystalline bodies. Thus we are dependent on the presence of minerals (crystals) for the absorption and utilization of proteids (colloids).

2. The minerals, also by virtue of osmosis, regulate and maintain the balance of density within the body. This rather awkward expression may be explained by a reference to the experiments with oysters outlined on page 66. When the oyster is immersed in a fluid of less

density than the fluids within its own body, their interchange results in the swelling or "fattening" of the oyster, by reason of the larger volume of less dense liquid absorbed through osmosis. Conversely, when the fluid in which the oyster is immersed is of greater density than the fluids of its body, the oyster shrinks in volume. (Compare Question 6, page 87.) The cells of the body are similarly subject to expansion and shrinkage according to the density of the fluids which bathe and surround them; and they may shrink to an extent which prevents normal functioning, or they may expand to the point of bursting. It is therefore on the minerals in solution that we depend for the regulation and maintenance of balance in the body.

3. It is due to the presence of the alkaline minerals in solution that the healthful alkalinity of the blood is maintained. (See pages 225–6.)

4. Minerals are present in every tissue of the body, whether bony, muscular, or fluid; and as these tissues are broken down in daily wear and tear, a constant supply of the minerals is needed for building or repair.

5. The minerals are also needed to aid in the solvent power of certain internal fluids, and for many other processes too complex for our present discussion.

We shall now discuss the special functions of the three minerals which are most likely to be lacking in our diet, so that no doubt may remain respecting the importance of providing them

What Calcium Does in the Body

1. The property possessed by the blood of coagulating, of forming a clot, and thus aiding to stop the flow from a wound, is due to the presence of calcium; and the cu-

rious abnormality in persons known as "bleeders," who are in danger of bleeding to death from the smallest wound, is attributed to the absence of this element.

2. Calcium forms a large part of the bony tissues of the body, hence is highly important in the diet of pregnant women and nursing mothers. Growing children need it, and poor teeth, weak, flexible bones, and possibly rickets, are attributed to a diet deficient in calcium.

3. Calcium is a powerful aid to the maintenance of healthful alkalinity in the blood stream.

4. Calcium is sometimes able to take the place of other minerals, notably magnesium, when deficient in the diet, and to perform their function.

5. Calcium seems especially effective in correcting the unbalanced conditions in the body already described on pages 221–2, and in restoring a correct equilibrium.

What Phosphorus Does in the Body

1. Phosphorus, like calcium, enters into the composition of the bones.

2. Phosphorus forms part of the complex substances called *phosphatids*, which are present in large amounts in brain and nerve tissue.

3. Phosphorus enters into the composition of all of the cells of the body; it conducts nerve stimuli; its compounds aid to some extent in maintaining neutrality of the solutions; and it is further said that no other element enters into so many of the different tissues of the body, or plays so many different parts in its various activities.

NOTE. This element has been found to be more deficient than any other in our American dietaries of the present time.

What Iron Does in the Body

1. Most of the iron in the body is found in the red blood cells, which are the carriers of oxygen. In this function they are rapidly being worn out and replaced, so that if enough iron is not taken into the body to make up the amount lost in these and other processes the result will be a more or less pronounced condition of anaemia.

2. Iron is needed every day, — it is every day used up and excreted; and there is no reserve store of this mineral, as there is of some of the others, maintained in the body to be drawn upon at need. Iron should therefore be supplied every day, and knowing this makes unnecessary any further insistence on the need to provide it in the daily diet.

Minerals in Organic *vs.* Inorganic Form

Some of the minerals, if not most of them, are better made use of in the body in what is known as organic form. This may be understood to mean that it depends on the quality rather than on the quantity of the compound in which they reach us that the minerals are going to do us the most good. For example, the chemical analyses of red meats, such as beef, etc., show them to contain generous amounts of iron, yet the iron in spinach and other greens is in so much better form to serve the body that we hardly think it worth while to count meat as a source of food iron. Phosphorus is also better made use of in organic form, therefore in the lists of composition of foods beginning on page 249 only those are marked which contain the organic forms of both iron and phosphorus.

To the Student. Another little-regarded essential in

the diet is the provision of alkali-forming foods to counteract the acid produced by the foods most abundant in the ordinary diet. The body is framed so as to be able to eliminate the acids formed during normal metabolism, but our usual diet is apt to overtax its capacity for this elimination, with frequently very unfortunate consequences.

Acid- and Alkali-Forming Foods

By an acid-forming food is meant, not one which is acid in its reaction, but one which produces an acid condition during its metabolism in the body. This occurs quite independently of the fact that the food is or is not acid in itself.

Similarly, an alkali-forming food is not necessarily one which contains free alkali, but one which produces alkaline conditions in the body.

Acid-producing foods are: Meats, poultry, and fish; visceral foods, nuts, legumes, and other foods of high-protein content; some of the fats, and the cereal grains.

Alkali-producing foods are: All fruits, whether fresh or dried, with the exception of prunes, plums, and cranberries, which contain benzoic acid, unchanged in the body. All vegetables, except the legumes; and milk is also alkali-producing. The acid, citrous fruits are highly alkali-forming in the body.

Now, what is the advantage of alkali-over acid-producing foods in the dietary? In experiments with animals it was found that they maintained good health on an acid-producing diet; yet if a man shows on examination for life insurance that there is excess of acid in his system he is not regarded as a good risk, and empirically we have good ground for the conclusion that so long as we keep

our blood stream alkaline nothing very serious in the line of the common ailments will be the matter with us.

For generations we have acted on this truth, in a blind, instinctive way, such as in the employment of "sweating-off" processes at the onset of an illness to break it up. Perspiration removes acid from the body, therefore gives nature a fair field to work a cure, as nature always will if given a chance without a handicap. Also, the old-fashioned remedy for a cold, still potent for good, is a glass of hot, strong lemonade — hot, to promote perspiration, strong with lemon, further to produce alkalinity.

For generations we have quoted to one another the adage that "an apple a day keeps the doc or away." A single apple will hardly keep him away for very long, but about three apples a day will counteract the acid produced by the grains in their various forms in our daily diet, from breadstuffs to porridge. Yet, not knowing the "why" of our prescriptions, we probably have erred a good deal in allowing the acid-forming foods to preponderate in our diet.

We have somehow thought it finer to serve rice as a starchy vegetable, especially with chicken or fish, than to serve potatoes. Yet the poor, unfashionable potato is highly alkali-forming, while the more stylish rice forms acid. We serve peas with lamb, and beans with beef and bacon, and if, in addition to these sins, we complete the meal with a custard dessert, or a baked Indian pudding, the repast is hopelessly acid-producing. We have porridge for breakfast, with eggs or fish to follow, and muffins and toast, leaving no loophole for alkalinity to predominate at the opening of the day. Perhaps meat or fish croquettes or a lobster salad, or a ham-and-egg sandwich forms our luncheon — and when, after days of

a similar régime, the insulted body protests, we wonder why we caught cold, or suffered the rheumatic or neuralgic pains, or the bilious attack, or the all-gone feeling. It would be a good, safe rule if for every known acid-forming food in each meal we introduced an antidote in the form of one to produce alkali. It is comforting to be assured that we can hardly err in a preponderance of the latter.

While on the suoject of this business of acid reaction in the body let me mention one or two causes other than ill-chosen food which pronouncedly tend to acid conditions. Lack of fresh air will do it; so will lack of healthful exercise. Indulgence in the unwholesome emotions of anger, worry, or fear will turn the blood most decidedly acid in a brief while. Food will be no corrective of these conditions so long as the emotions rule; it is a case of keeping the heart with all diligence. When our Christian Science friends insist on total elimination of the fear-thought, when they come down good and hard on the smallest touch of worry, and when they once and for all exorcise anger, it is not to be wondered at that disease is cured, and it would be greatly to be wondered at if it could persist, in a body so cleansed from one great factor in the development of acidosis.

In the lists which follow there will be shown the content of the common foods in vitamines and minerals, and the degree to which each is alkali-producing.

NOTE

Pages 249, 250, and 251 should immediately follow page 227 as part of Chapter XXII.

APPENDICES

PREFACE TO APPENDIX A

THE composition of the foods in the series of charts in Appendix A has been adapted from Bulletin 28, United States Department of Agriculture, Office of Experiment Stations. The percentage composition given in Bulletin 28 has been translated into pounds and ounces, for the convenience of the housekeeper, since food is purchased — and thought of — in this way by the "plain woman" (to paraphrase the language of the philosophers), who buys and cooks, if not by the scientist.

These pounds and ounces have been estimated in as nearly round numbers as possible. Common foods are not of definite chemical composition; no two samples of any one food yield identical results on analysis — hence, to repeat, round averages have been given, as being easier to remember, easier to calculate from, and sufficiently correct for everyday use.

The estimation of the nutrients has been made from the analyses of the foods "as purchased," since we are all interested in knowing just what we get for our money when we go to market, and just how much of that good money has to be spent for "refuse."

The calorific value of each food has been copied without alteration from Bulletin 28, from the average "as purchased."

On the other hand, the 100-calorie portions have been estimated from the foods as cooked and ready to serve, so that the portions are, presumably, wholly edible.

APPENDIX A

CHARTS OF THE COMPOSITION OF FOODS

I

BREAD, CAKE, AND CRACKERS—AS PURCHASED

NAME		Am't in 1 lb.	Ounces of the following in 1 lb.					No. of Calories fr. 1 lb.
			Protein	Fat	C'hy	Water	Salts	
Boston brown bread	$0.04	⅛ of 5¢ loaf	2.0	0.2	8.0	5.7	0.1	1230
Graham	.05	1 loaf	1.5	0.3	8.3	5.7	0.2	1210
Rye	.05	1 loaf	1.5	0.1	8.5	5.7	0.2	1190
White	.05	1 loaf	1.5	0.2	8.5	5.7	0.1	1215
Zwieback	.10	44 zwbk.	1.6	1.6	11.7	1.0	0.1	1970
Cake, avg. of	.15		1.0	1.5	10.0	3.3	0.2	1675
Crackers, avg.	.25	64 soda	1.4	1.4	12.0	1.0	0.2	1905

100-Calorie Portion of Above, as Purchased

Boston brown bread	1.3 ounces,	one rather small, round slice.
Graham bread	1.3 ounces,	one good slice.
Rye bread . . .	1.3 ounces,	one good slice.
White bread . . .	1.3 ounces,	one good slice.
Zwieback	0.8 ounce,	between 2–3 zwieback.
Cake	1.0 ounce,	
Crackers	0.8 ounce,	between 3–4 crackers.

II

CEREALS AND CEREAL PREPARATIONS—AS PURCHASED

Name		Am't in 1 lb.	Ounces of the following in 1 lb.					No. of Calories fr. 1 lb.
			Protein	Fat	C'hy	Water	Salts	
Barley (meal)	$0.10	2 cups	1.6	0.3	11.7	2.0	0.4	1640
Corn meal	.04	2¼ cups	1.5	0.3	12.0	2.0	0.2	1655
Macaroni	.12	40 stks.	2.2	0.1	11.8	1.7	0.2	1665
Oatmeal	.05	2 cups	2.5	1.2	11.0	1.0	0.3	1860
*Rice	.08	2 cups	1.3	0.0	12.6	2.0	0.1	1630
Rolled oats	.05	3 cups	2.6	1.2	10.7	1.2	0.3	1850
Flaked wheat	.08	3–6 cups	2.0	0.3	12.0	1.4	0.3	1690
Shredded wheat	.12½	12 cups	2.0	0.3	12.0	1.5	0.2	1700
Wheat germs	.07	2 cups	1.6	0.3	12.2	1.7	0.2	1695

* Amounts of the nutrients under 0.1 ounce in 1 lb. are omitted, since such small quantities may be disregarded in ordinary work.

100-Calorie Portion of Above, as Ready to Serve

Corn-meal mush	4–5 ounces,	an ordinary helping, about a half-cupful.
Macaroni	3–4 ounces,	a side dishful as usually helped.
Oatmeal porridge	3–4 ounces,	an ordinary helping, a small half-cupful.
Rice, boiled	3–4 ounces,	an ordinary helping, a small half-cupful.
Rolled oats, porridge	3–4 ounces,	an ordinary helping, a small half-cupful.
Flaked wheat, dry	1 ounce,	¼ to ½ of 1 cupful.
Shredded wheat	1 ounce,	one shredded-wheat biscuit.
Wheat germs	3–4 ounces,	an ordinary helping, a small half-cupful.

III

DAIRY PRODUCE—AS PURCHASED

Name		Am't in 1 lb.	Ounces of the following in 1 lb.						No. of Calories fr. 1 lb.
			Protein	Fat	C'hy	Water	Salts	Refuse	
Butter	$0.30	2 cups	0.2	13.5	..	1.8	0.5	..	3605
Buttermilk	.01¼	1 pint	0.4	0.1	0.7	14.7	0.1	..	165
Cheese	.20	...	4.5	5.5	0.1	5.2	0.7	..	2055
Cream cheese	.20	...	4.0	5.4	0.4	5.7	0.5	..	1950
Cream	.10–20	1 pint	0.4	3.0	0.6	12.0	0.1	..	910
Milk	.03–05	1 pint	0.5	0.6	0.8	14.0	0.1	..	325
Skimmed milk	.01¼	1 pint	0.5	0.0	0.8	14.6	0.1	..	170
Whey	...	1 pint	0.1	0.0	0.8	15.0	0.1	..	125

100-Calorie Portion of Above, as Purchased

Butter	0.5 ounce,	1 small ball or square.
Buttermilk	10.0 ounces,	1½ glasses.
Cheese	0.8 ounce,	an ordinary cube, 1½ to 2-inch.
Cream cheese	0.8 ounce,	an ordinary 1½ to 2-inch cube.
Cream	2.0 ounces,	¼ cupful.
Milk	5.0 ounces,	a generous ⅔ of 1 cupful.
Skimmed milk	9–10 ounces,	1⅛ to 1¼ cupfuls.
Whey	12.0 ounces,	1½ cupfuls.

IV

FRUIT, DRIED — AS PURCHASED

Name		Am't in 1 lb.	Ounces of the following in 1 lb.						No. of Calories fr. 1 lb.
			Protein	Fat	C'hy	Water	Salts	Refuse	
Apples	$0.10	4 cups	0.3	0.3	10.7	4.5	0.2	..	1350
Apricots	.15	80 apr.	0.8	0.2	10.0	4.7	0.3	..	1290
Currants	.12	2 cups	0.5	0.3	12.0	2.5	0.7	..	1500
Dates	.10	60 dts.	0.3	0.5	11.5	2.2	0.1	1.4	1450
Figs	.16	16 fgs.	0.8	0.0	12.0	3.0	0.2	..	1475
Prunes	.10	40–50	0.3	0.0	10.0	3.0	0.2	2.5	1200
Raisins	.12	2 cups	0.5	0.5	11.0	2.5	0.5	1.0	1450

100-Calorie Portion of Above, as Purchased

Apples	0.8 ounce,	nearly ¼ of 1 cupful.
Apricots	0.8 ounce,	3 to 4 apricots.
Currants	1.1 ounces,	about ⅛ of 1 cupful.
Dates	1.2 ounces,	about 4 dates.
Figs	1.1 ounces,	1 large fig.
Prunes	1.4 ounces,	3 to 4 prunes.
Raisins	1.2 ounces,	About ⅛ of 1 cupful.

V

FRUIT, FRESH — AS PURCHASED

Name		Am't in 1 lb.	Ounces of the following in 1 lb.						No. of Calories fr. 1 lb.
			Protein	Fat	C'hy	Water	Salts	Refuse	
Apples	$0.03–04	3 avg.	0.1	0.0	1.8	10.0	0.1	4.0	220
Apricots	....	6 avg.	0.1	0.0	2.0	12.0	0.1	1.0	255
Bananas	.05	3–4	0.1	0.1	2.3	8.2	0.1	5.2	300
Cherries	....	100–130	0.1	0.1	2.5	12.0	0.1	0.8	345
Cranberries	.10	4 cups	0.1	0.1	1.6	14.2	0.0	..	215
Grapes	.05–25	100–120	0.1	0.2	2.3	9.3	0.1	2–4	335
Melons	....	....	0.1	0.0	0.7	7.2	0.0	8.0	90
Oranges	.05–10	2–3	0.1	0.0	1.3	10.2	0.1	4.3	170
Peaches	....	5–6	0.1	0.0	1.4	11.2	0.1	3.2	145
Plums	....	....	0.1	0.0	3.2	11.8	0.1	0.8	370
Pears	....	3–4	0.1	0.0	2.0	12.2	0.1	1.6	260
Strawberries	.15	1½ qts.	0.1	0.1	1.2	13.7	0.1	0.8	175

100-Calorie Portion of Above, as Ready to Serve

Apples	7 ounces,	1 to 2 apples.
Apricots	6–7 ounces,	2 to 3 apricots.
Bananas	5 ounces,	1 good-sized banana.
Cherries	4 ounces,	30 to 35 cherries.
Cranberries	7 ounces,	nearly a cupful of stewed berries (without sugar).
Grapes	5 ounces,	20 to 25 grapes.
Melons		
Oranges	9 ounces,	1 big orange.
Peaches	10 ounces,	about 3 peaches.
Plums	4–5 ounces,	1 to 3 plums.
Pears	7 ounces,	1 to 2 pears.
Strawberries	9 ounces,	30–50 berries.

VI

FISH, GROUP I

Name		Ounces of the following in 1 lb.						No. of Calories fr. 1 lb.
		Protein	Fat	C'hy	Water	Salts	Refuse	
Black bass	$0.22	1.5	0.1	...	5.5	0.1	8.8	205
Buffalo fish	.10	1.4	0.2	...	6.0	0.1	8.3	205
Codfish	.12	1.3	0.0	...	6.3	0.1	8.3	165
Dried codfish	.08	4.5	0.0	...	8.8	2.4	0.3	400
Haddock	.12	1.4	0.0	...	6.5	0.1	8.0	165
Flounder	.15	1.0	0.0	...	5.2	0.1	9.7	115
Perch (white)	.10	1.2	0.2	...	4.5	0.1	10.0	200
Pickerel (pike)	.12	1.4	0.0	...	7.0	0.1	7.5	190
Red snapper	.15	1.7	0.1	...	6.7	0.1	7.4	225

100-Calorie Portion of Above, as Ready to Serve

Black bass . 3.5 ounces.
Buffalo fish 3.5 ounces.
Codfish . . 4.5 ounces.
Dried codfish 1.4 ounces.
Haddock 4.5 ounces.
Flounder . . . . 6.0 ounces.
Perch (white) 3.5 ounces.
Pickerel (pike) . 3.3 ounces.
Red snapper 3.2 ounces.

QUESTIONS

Why is the water-content of dried codfish higher than that of fresh?

Considering the amount of refuse in dried and in fresh codfish, which is the more economical purchase, that is, which will yield the most protein and the largest number of calories for an equal sum?

VII

FISH, CRUSTACEOUS — AS PURCHASED

Name		Am't in 1 lb.	Ounces of the following in 1 lb.						No. of Calories fr. 1 lb.
			Protein	Fat	C'hy	Water	Salts	Refuse	
Clams (solids)	$0.20	15–20	1.8	0.1	0.8	13.0	0.3	...	340
Crabs, in shell	.30	6 avg.	1.3	0.1	0.1	6.0	0.2	8.3	195
Lobster	.25	½ of 1 lobster	1.0	0.1	0.0	4.8	0.1	10.0	140
Oysters (solids)	.20	1 pint or 20 avg.	1.0	0.3	0.5	14.0	0.2	....	335
Scallops	.20	1 pint or 20–30	2.3	0.0	0.5	13.0	1.2	...	345

100-Calorie Portion of Above, as Ready to Serve

Clams, cooked	4 ounces,	3–5 clams.
Crabs, meat of	3 ounces,	meat of from 2–3 crabs after cooking.
Lobster, meat of . .	4 ounces,	about ⅓ of the meat of 1 lobster.
Oysters, cooked	5 ounces,	about 5 oysters.
Scallops . . .	4.7 ounces,	5 to 8 scallops.

VIII

FISH, GROUP II — AS PURCHASED

Name		Ounces of the following in 1 lb.						No. of Calories fr. 1 lb.
		Protein	Fat	C'hy	Water	Salts	Refuse	
Butterfish	....	1.5	1.0	...	6.4	0.1	7.0	460
Catfish	$0.15	3.0	2.7	...	8.2	0.1	3.0	915
Eel	.12	2.5	1.4	...	9.0	0.1	3.0	580
Halibut	.16–25	2.5	0.8	...	9.3	0.1	2.3	470
Lake trout	.15	1.5	0.8	...	6.0	0.1	7.6	385
Mackerel	.25	1.7	0.6	...	6.6	0.1	7.0	365
Salmon	.12–20	2.4	1.5	...	6.5	0.1	5.5	660
Shad	.20	1.5	0.8	...	5.6	0.1	8.0	380
Whitefish	.15	1.7	0.5	...	5.2	0.1	8.5	325

100-Calorie Portion of Above, as Ready to Serve

Butterfish . . 3.0 ounces.
Catfish 1.5 ounces.
Eel . . 2.8 ounces.
Halibut . . 3.0 ounces.
Lake trout . . 3.0 ounces.
Mackerel . . . 3.5 ounces.
Salmon . . . . . 2.0 ounces.
Shad . . . . . 3.0 ounces.
Whitefish . . . . . 3.7 ounces.

QUESTIONS

Which group of fish has the highest calorific value? To what may this be attributed? Could the two groups be classified on this basis?

IX

FLOUR, SUGAR, SYRUP, CHOCOLATE, ETC. AS PURCHASED

Name		Am't in 1 lb.	Ounces of the following in 1 lb.					No. of Calories fr. 1 lb.
			Protein	Fat	C'hy	Water	Salts	
Bread flour	$0.04	3 cups	1.7	0.2	12.2	1.8	0.1	1665
Pastry flour	.07	3½ cups	1.3	0.2	12.2	2.2	0.1	1625
Whole wheat flour	.04	2½ cups	2.2	0.3	11.5	1.8	0.2	1675
Graham flour	.04	3 cups	2.2	0.3	11.4	1.8	0.3	1670
Corn starch	.10	2¼ cups	0.0	0.0	14.5	1.5	0.0	1675
Cane sugar	.06	2 cups	0.0	0.0	16.0	0.0	0.0	1860
Honey, strained	.25	1½ cups	0.0	0.0	13.0	3.0	0.0	1520
Molasses	.06	1 pint	0.2	0.0	11.3	4.0	0.5	1290
Tapioca	.10	2 cups	0.2	0.0	14.0	1.8	0.0	1650
Chocolate	.50	16 sqrs.	2.0	7.6	5.0	1.0	0.4	2860
Cocoa	.50	2 cups	3.3	4.5	6.0	0.8	1.4	2320
Olive oil	.50–75	1 pint	0.0	16.0	0.0	0.0	0.0	4082

100-Calorie Portion of the Foods, as Purchased

Bread and other flours .	1.0 ounce,	3 tablespoons, or as much flour as will make one biscuit of average size.
Corn starch	1.0 ounce,	2 tablespoons, or as much as will stiffen 1 cup of milk or other liquid to a mold.
Cane sugar	0.9 ounce,	nearly 2 tablespoons of granulated sugar, or 3–4 lumps.
Honey, strained	1.0 ounce,	2 tablespoonfuls.
Molasses . . .	1.4 ounces,	2 generous tablespoonfuls.
Tapioca . .	1.0 ounce,	2 tablespoons, enough to make a cupful of pudding.
Chocolate	0.6 ounce,	half a square, or just a little over.
Cocoa	0.8 ounce,	3 tablespoons.
Olive oil	0.2 ounce,	1½ teaspoonfuls.

X

MEATS AND OTHER FOODS OF ANIMAL ORIGIN

Name		Ounces of the following in 1 lb.						No. of Calories fr. 1 lb.
		Protein	Fat	C'hy	Water	Salts	Refuse	
Bacon	$0.15–25	1.3	10.0	...	2.5	0.7	1.3	2795
Beef	.10–30	2.5	1.8	...	8.6	0.1	3.0	735
Corned beef	.08–18	2.0	4.0	...	8.0	0.7	1.3	1271
Dried beef	.25–30	4.0	1.3	...	8.5	1.5	0.7	780
Lamb	.10–30	2.0	3.0	...	7.5	0.1	3.4	1055
Mutton	.08–25	2.0	3.8	...	7.0	0.1	3.0	1255
Pork	.15–20	1.3	7.6	...	5.0	0.1	2.0	2215
Veal	.10–25	2.8	1.0	...	8.5	0.1	3.6	580
Eggs, hen's	.15–35	2.0	1.5	...	10.6	0.1	1.8	650
Gelatine	.60–1.25	13.4	...	...	2.0	0.6	...	1705

100-Calorie Portion of Above Foods, as Usually Served

Bacon	0.5 ounce,	or from 1 to 2 small, thin slices.
Beef	3.0 ounces,	or an ordinary small helping.
Corned beef	1.5 ounces,	or an ordinary helping.
Dried beef	2.8 ounces,	or an ordinary good helping.
Lamb	1.4 ounces,	or ½ of 1 chop, or twice the volume of lean from the leg, etc.
Mutton	1.6 ounces,	or an ordinary slice.
Pork	0.4 ounce,	or ½ of a small slice.
Veal	3.0 ounces,	or an ordinary helping.
Eggs	2.5 ounces,	or 1 very large egg, or 1¼ eggs of average size.
Gelatine	1.0 ounce,	or about 2 tablespoonfuls of the dry, granulated gelatine.

XI

NUTS, IN SHELL — AS PURCHASED

Name		Am't in 1 lb.	Ounces of the following in 1 lb.						No. of Calories fr. 1 lb.
			Protein	Fat	C'hy	Water	Salts	Refuse	
Almonds	$0.20–25	120	2.0	4.8	1.5	0.5	0.2	7.0	1660
Butternuts	.....	....	0.6	1.3	0.1	0.1	0.1	13.8	430
Chestnuts	.10–20	....	1.3	0.8	9.0	0.8	0.3	3.8	1425
Cocoanuts	.05–10	1 small	0.5	4.2	2.4	1.0	0.1	7.8	1413
Filberts	.15	4 cups	1.2	5.0	1.0	0.3	0.2	8.3	1575
Hickory	.05	100	1.0	4.0	0.7	0.2	0.2	10.0	1265
Peanuts	.05	1 qt.	3.0	4.5	3.0	1.0	0.2	4.3	1935
Pecans	.20–25	100	1.0	5.3	1.0	0.2	0.2	8.4	1846
Walnuts	.30	50	1.0	4.2	1.0	0.2	0.1	9.5	1375

100-Calorie Portion of Above, as Purchased

Almonds	1 ounce,	7 or 8 almonds.
Butternuts	4 ounces,	
Chestnuts	1.1 ounces,	1 to 2 chestnuts.
Cocoanuts	1.1 ounces,	
Filberts	1.0 ounce,	10 to 12 nuts.
Hickory nuts	1.3 ounces,	6 to 8 nuts.
Peanuts	0.8 ounce,	about a dozen.
Pecans	0.8 ounce,	6 to 8 nuts.
Walnuts	0.9 ounce,	4 whole walnuts.

XII

POULTRY

Name		Ounces of the following in 1 lb.						No. of Calories fr. 1 lb.
		Protein	Fat	C'hy	Water	Salts	Refuse	
Chicken	$0.15–20	2.0	0.2	...	7.0	0.1	6.7	295
Duck	.18–20	2.0	4.0	...	6.0	0.1	3.0	1220
Fowl	.12–16	2.4	2.0	...	7.5	0.1	4.0	775
Goose	.15–20	2.2	4.5	...	6.4	0.1	2.8	1506
Turkey	.18–25	2.8	3.0	...	6.6	0.1	3.5	1075

100-Calorie Portion of Above Foods, as Usually Served

Chicken	3.0 ounces,	1 small second joint, or a side of the breast.
Duck	1.0 ounce,	an equivalent portion, or a moderate helping.
Fowl	1.7 ounces,	an equivalent portion, or a moderate helping.
Goose	0.8 ounce,	an equivalent portion, or a moderate helping.
Turkey	1.3 ounces,	an equivalent portion, or a moderate helping.

QUESTIONS

Account for the fact that there is a larger proportion of refuse in chicken than in the other forms of poultry.

Considering the calorific value and the amount of refuse in these foods as purchased, which would be the most economical kind of poultry to buy at the highest cost given for each?

XIII

VEGETABLES, GREEN — AS PURCHASED

Name		Am't in 1 lb.	Ounces of the following in 1 lb.						No. of Calories fr. 1 lb.
			Protein	Fat	C'hy	Water	Salts	Refuse	
Asparagus	$0.10–20	1 good bunch	0.4	0.0	0.5	15.0	0.1	..	103
Cabbage	.03–08	⅛–½ head	0.3	0.0	0.8	12.8	0.1	2.0	125
Cauliflower	.10	1 small head	0.3	0.1	0.8	14.7	0.1	..	140
Celery	.20	2 heads	0.2	0.0	0.5	12.0	0.1	3.0	70
Lettuce	.20	2 heads	0.2	0.0	0.5	12.8	0.1	2.4	75
Spinach	.08–10	1 quart	0.3	0.0	0.6	14.8	0.3	..	110

100-Calorie Portion of Above, as Ready to Serve

Asparagus	14 ounces,	almost, after cooking.
Cabbage	11 ounces,	after cooking.
Cauliflower	12 ounces,	after cooking.
Celery	1⅓ pounds,	
Lettuce	1¼ pounds,	
Spinach	12 ounces,	after cooking.

QUESTIONS

What could be added to these vegetables as seasoning or condiment to bring up their calorific value?

XIV

VEGETABLES, LEGUMINOUS — AS PURCHASED

Name		Am't in 1 lb.	Ounces of the following in 1 lb.						No. of Calories fr. 1 lb.
			Protein	Fat	C'hy	Water	Salts	Refuse	
Beans, butter	$0.12½	80 pods	0.7	0.0	2.5	4.7	0.1	8.0	370
Beans, dried	.05	2 cups	3.6	0.3	9.5	2.0	0.6	..	1605
Beans, Lima, fresh	.12	.....	0.5	0.0	1.6	5.0	0.1	8.8	255
Beans, Lima dried	.10	2⅓ cups	3.0	0.2	10.6	1.6	0.6	..	1625
Beans, string	.15	100 pods	0.3	0.0	1.0	13.5	0.2	..	180
Lentils	.10	2¼ cups	4.0	0.1	9.5	1.4	1.0	..	1620
Peas, dried	.05	2 cups	4.0	0.1	10.0	1.5	0.4	..	1655
Peas, green	.15	100 pods	0.5	0.0	1.5	6.5	0.1	7.4	255

100-Calorie Portion of Above, as Ready to Serve

Beans, butter	3 ounces,	1 good helping, something less than ½ cupful.
Beans, dried, cooked	2–3 ounces,	1 small helping.
Beans, Lima	4 ounces,	a large helping, ½ cupful.
Beans, Lima, dried, cooked	3 ounces,	1 good helping.
Beans, string	1 pound,	about a pint.
Lentils	3–4 ounces,	a good helping.
Peas, dried, cooked	2–3 ounces,	a small helping.
Peas, green	3–4 ounces,	a good helping.

XV

VEGETABLES, STARCHY—AS PURCHASED

Name		Am't in 1 lb.	Ounces of the following in 1 lb.						No. of Calories fr. 1 lb.
			Protein	Fat	C'hy	Water	Salts	Refuse	
Hominy	....	3½ cups	1.5	0.1	12.5	1.8	0.1	..	1650
Macaroni	See Cereals and Cereal Preparations, page 218								
Potatoes	$.01–02	3–4	0.3	0.0	2.5	10.5	0.1	2.6	310
Rice	See Cereals and Cereal Preparations, page 218								
Sweet potatoes	.03	3–4	0.3	0.1	3.5	9.4	0.1	2.6	460

100-Calorie Portion of Above, as Ready to Serve

Hominy	4 ounces,	½ cupful of cooked hominy.
Macaroni	4 ounces, nearly,	the usual helping.
Potatoes	4–5 ounces,	1 good-sized potato
Rice	3–4 ounces,	the usual helping.
Sweet potatoes	3–4 ounces,	½ of a large, or 1 small sweet potato.

XVI

VEGETABLES, SUCCULENT — AS PURCHASED

Name		Am't in 1 lb.	Ounces of the following in 1 lb.						No. of Calories fr. 1 lb.
			Protein	Fat	C'by	Water	Salts	Refuse	
Cucumber	$0.20	1½–2 large	0.1	0.0	0.4	13.0	0.1	2.4	70
Egg plant	.05–10	½ of 1 egg pl.	0.2	0.0	1.0	14.7	0.1	...	130
Green corn	.01–02	2–4 ears	0.2	0.1	1.2	4.4	0.1	10.0	455
Squash	.05	½–1 sq.	0.1	0.0	0.8	7.0	0.1	8.0	105
Tomatoes	.01–02	2–4	0.1	0.1	0.7	15.0	0.1	...	105

100-Calorie Portion of Above, as Ready to Serve

Cucumbers, pared . . 1¼ pounds, 2 to 4 cucumbers, after paring.
Egg plant, fried . . . 12–14 ounces, 7 or 8 good slices.
Green corn . . . . 4–5 ounces, 1 medium-sized ear, after cooking.
Squash, cooked . . . 8 ounces, a cupful of pulp, after cooking.
Tomatoes . . . 1 pound, nearly a pint of cooked tomato.

XVII

VEGETABLES, ROOT — AS PURCHASED

Name		Am't in 1 lb.	Ounces of the following in 1 lb.						No. of Calories fr. 1 lb.
			Protein	Fat	C'hy	Water	Salts	Refuse	
Beets	.....	3–6	0.2	0.0	1.5	11.2	0.1	3.0	170
Carrots	.....	2–6	0.2	0.0	1.5	11.0	0.1	3.2	160
Onions	$0.03	4–6	0.2	0.1	1.5	12.6	0.1	1.5	205
Parsnips	.02	2–5	0.2	0.1	1.8	11.0	0.2	2.7	240
Rutabagas	.02	½ of 1 Rb.	0.2	0.0	1.1	10.0	0.1	4.6	135
Turnips	.01–02	3–4	0.2	0.0	1.0	10.0	0.1	4.7	125

100-Calorie Portion of Above, as Ready to Serve

Beets . . . . . 7–8 ounces, 3 medium-sized beets, after peeling.
Carrots . . . . . 7–8 ounces, 3 medium-sized carrots.
Onions . . . . . 7–8 ounces, 2 to 3 onions.
Parsnips . . . . . 5–6 ounces, 1 to 2 parsnips.
Rutabagas . . . . . 10–12 ounces, a heaping cupful of the mashed vegetable.
Turnips . . . . . 8–9 ounces, 2 to 3 turnips.

XVIII

VISCERAL FOODS—AS PURCHASED

NAME		Am't in 1 lb.	Ounces of the following in 1 lb.						No. of Calories fr. 1 lb.
			Protein	Fat	C'by	Water	Salts	Refuse	
Brains, calves'	$0.12½	1 pair	1.4	1.5	...	13.0	0.1	..	555
Heart, beef's	.08	½–⅓ of 1 heart	2.5	4.0	...	8.4	0.1	1.0	1320
Kidneys, veal or lamb	.05	4–6, or 1 kdny. beef	2.5	1.3	...	12.0	0.2	..	585
Liver, calves'	.....	2–4 slices	3.0	1.5	0.4	11.0	0.1	..	575
Sweetbreads	.30	1–2 pair	2.5	2.0	...	11.3	0.2	..	825
Tongue, beef's	.12	½–⅓ of 1 tongue	2.5	1.0	...	8.4	0.1	4.0	545
Tripe	.08–10	.....	2.6	1.3	...	12.0	0.1	..	270

100-Calorie Portion of Above, as Ready to Serve

Brains	2½ ounces,	
Heart	1.0 ounce,	
Kidneys	2.0 ounces,	½ to 1 kidney.
Liver	2.0 ounces,	¼ to ½ a slice.
Sweetbreads	2.0 ounces,	
Tongue	1.5 ounces,	
Tripe	6.0 ounces,	

Account for the presence of carbohydrate where it occurs in visceral foods.

TABLE OF FOODS

Showing Quantitative Estimate of Vitamines, Minerals, and Alkali

Compiled from conclusions of standard American authorities, and of the British Medical Research Committee.

NOTE. One asterisk shows the substance named in the heading to be present in more or less appreciable quantity; two asterisks show it to be present in fairly abundant amount; three, show it in its largest quantity. No asterisk means a very small amount or none. The figures representing the alkalinity are comparative.

	Vitamines			Minerals			Alkalinity
	A	B	C	Ca	P	Fe	
Apples		*	**				6
Apricots		*	**				11
Barley, whole	*	**			**	**	
Beans, dried		**		*	**	***	
Beet greens	**	*	**			*	20
Brains, calves	*	**					
Bran, wheat		**		*	*	**	
Butter	***						
Cabbage, raw	*	*	***			*	20
Carrots, raw	*	*	*				24
Cauliflower		*	*	*			17
Celery		*		*			42
Cheese	**			***	**		
Chives	**	*	**	*		*	20
Corn, sugar, yellow	?	**			*		
Cream	**			*	*		
Cucumbers		*					45
Cress				*		*	20
Dates						*	3
Dandelions	**	*	**			*	20
Eggs	**	***	***	*	**	*	
Figs, dried	*	*	*				32
Fish, fat (see page 224)	**	*			*		
Graham flour		*				*	
Grapes		*	**				3
Grape juice		*	**				4

	Vitamines			Minerals			Alkalinity
	A	B	C	Ca	P	Fe	
Heart, beef, etc.	**	**					
Kidneys	**	*					
Lard, or pork fat							
Lemons		**	***				12
Lentils, dried		**		*	**	***	
Lettuce	**	*	**			*	38
Liver	**	**	*				
Meats, fresh, lean, all kinds		*	*		*		
Milk, whole	**	*	*	*	*		3
Molasses				*			
Muskmelon		*	**				19
Mutton fat	?						
Oleo fat from beef	*						
Oatmeal	*	**			**	**	
Onions		*	*				3
Oranges		**	***				11
Parsnips		*			*		18
Peaches		*	**				12
Peanuts		**			**	*	
Pears		*	**				5
Peas, dried		**		*	**	***	
Pecans		**			**	*	
Pineapple		*	**				15
Plums		*	**				
Potatoes, unpared	*	*	*				8
Potatoes, sweet	?	*	?				
Prunes		*	**		*	*	
Pumpkins		*					6
Raisins					*	*	7
Shredded wheat	*	**			**	**	
Spinach	**	*	**			*	113
Sprouted grains	**	**	**		**	**	
Sprouted pulses (legumes)	**	**	**	*	**	***	
Suet, beef							
Sweetbreads	*	**					
Rye, whole	*	**			**	**	
Tomatoes, fresh or canned	?	**	**				24
Turnips, Swede, raw		*	***				7
Turnip tops	**			*		*	20
Walnuts		**	*				
Wheat, whole		**			**	**	
Yeast	?	***					

REFERENCES

The Newer Knowledge of Nutrition. E. V. McCollum.
Sherman, Henry C. Chemistry of Food and Nutrition, Second Edition.
Harrow, Benjamin. Vitamines.
Journal of Biological Chemistry, current numbers.
British Medical Journal, current numbers.

QUESTIONS

1. Name the foods richest, respectively in the three kinds of vitamines.
2. Name the vitamine-free foods.
3. Which of the foods are richest in each of the minerals?
4. Which fruits and vegetables are not alkali-forming in the body?
5. Name all the foods which do not form alkali in the body.
6. Make lists of the foods which are powerful alkali-producers, of those which produce a moderate proportion of alkali, and of those which produce a small proportion of alkali.

EXERCISES

Make a recipe for as many dishes as possible which are complete in themselves, that is, which furnish protein, vitamines, minerals, and alkali-forming foods.

To the following foods, namely, eggs, cheese, and beef, add two more which will supply all the essentials for a balanced meal.

Name three foods for each of the meals for one day which will provide all the essentials for each meal if served as the main dishes.

APPENDIX B

TIME TABLES FOR COOKING

Time Table for Cooking Meats, Poultry, and Fish

I. MEATS

Baking.	HOURS	MIN.
Beef, rare, per pound		8–12
Beef, well done, per pound		15
Beef, fillet, very hot oven		30
Beef, sirloin or ribs, 5 lbs., rare	1	5
Beef, sirloin or ribs, 5 lbs., well done	1	20
Beef, sirloin or ribs, 10 lbs., rare	1	30
Beef, sirloin or ribs, 10 lbs., well done	1	50
Beef, rump or chuck, 10 lbs., rare	1	35
Beef, rump or chuck, 10 lbs., well done	2	
Lamb, per pound		15–18
Lamb, crown of	1	
Lamb, fore quarter, 6–8 lbs.	1	30
Lamb, leg, 6 lbs.	1	30
Mutton, rare, per pound		10
Mutton, well done, per pound		15
Mutton, large leg, 12 lbs.	2	
Mutton, saddle	1	15–30
Mutton, shoulder, stuffed, 5–6 lbs.	1	15
Pork, per pound		30
Veal, per pound		20
Venison, per pound		10
Boiling.		
Beef, per pound		15–20
Beef, corned, per pound		30
Mutton, per pound		15–20
Broiling.		
Chops, French or loin		6
Chops, English		8–10
Steak, 1 in. thick		4–8
Steak, 1½ in. thick		6–10

Frying.	HOURS	MIN.
Bacon, thin		3–5
Chicken		6–8
Chops, breaded		5
Croquettes		1–2

Tests for cooking meat.

1. The muscle, when slightly pressed, is elastic; it loses elasticity when overcooked.
2. When pressed close to the bone with the tines of a fork, if the juice that flows is very slightly pink, the meat is properly cooked. If the juice is red the meat is underdone; if colorless, it is overcooked.

NOTE. The length of time for cooking fish and meat depends more on the shape than on the weight of the piece—a thick, chunky piece calling for a longer time than a thin, flat piece.

II. POULTRY

Baking.		
Chicken, 3–4 lbs.	1–1½	
Duck		45–60
Duck, wild, very hot oven		20–30
Fowl, 4–5 lbs.	2–2½	
Goose, 8 lbs.	2	
Turkey, 8 lbs.	1¾–2	
Turkey, 12 lbs.	3	
Boiling.		
Chicken, per pound		15–20
Chicken, 3 lbs.		50–60
Fowl, per pound		20–30
Turkey, per pound		18
Turkey, 9 lbs.	2½	
Broiling.		
Chicken, spring		20
Squab		10–12
Frying.		
Chicken		6–8

Test for the cooking of poultry.

The joint at the end of the leg breaks off easily.

III. FISH

Baking.	HOURS	MIN.
Thick fish, per pound		10–15
Thin fish, per pound		8–10
Halibut, 6 lbs.	1	

Boiling.	
Thick fish, *e. g.*, halibut, salmon, per lb.	15
Thick fish, *e. g.*, bluefish, bass, per lb.	8–10
Thin fish, *e. g.*, flounder, per pound	6–8
Clams (to steam)	20
Lobster, for salad	25–30
Lobster, to be re-cooked	15–20

Frying.	
Fillets or steaks	4–7
Smelts, trout, and other small fish	3–5

Test for the cooking of fish.

When the flesh can readily be separated from the bone, the fish is cooked.

Time Table for Cooking Vegetables

Boiling.		
Artichokes		30–45
Asparagus		15–30
Beans, shelled		30–60
Beans, string	¾–2½	

Boiling.		
Beets, young		45
Beets, old	1–3	
Brussels sprouts		20–25
Cabbage, young		30–45
Cabbage, old	1	
Carrots		30–60
Cauliflower		30–45
Celery, stewed		20–45
Corn, green		3–25
Dandelion greens		45–60
Macaroni		20–40

Boiling — *continued.*	HOURS	MIN.
Onions		30–60
Okra	1	
Oyster plant		45–60
Parsnips		30–45
Peas		12–45
Potatoes		30
Potatoes, sweet		45
Rice		20–30
Spinach		20–40
Squash, summer		20
Squash, winter		30
Tomatoes, stewed		15–25
Turnips, white		30–45
Turnips, yellow		30–60
Baking.		
Beans	8–10	
Beets	¾–1	
Onions	¾–1½	
Potatoes		45
Squash		45
Sweet potatoes	1	
Tomatoes		10–20
Frying.		
Egg plant		5–8
Potatoes, French fried		10–15
Potatoes, sliced		4–8
Summer squash		4

Time Table for Cooking Flour Mixtures, etc.

I. BREAD, MUFFINS, AND CAKES

Baking.		
Biscuits, soda or baking powder		12–20
Bread, 1 lb. loaf, 1 cup wetting		40–45
Bread rolls		15–25
Bread sticks		10–15
Cake, angel or sponge		45–60
Cake, layer		12–20
Cake, loaf		40–60
Cake, fruit	1¼–2	
Cake, plain cup		35–45

	HOURS	MIN.
Baking — *continued.*		
Cake, pound	1¼–1½	
Cake, wedding	3 h. or steam 2h. and bake 1½ h.	
Cookies		6–12
Corn cake, thick		25–30
Corn cake, thin		15–20
Gingerbread		20–30
Graham gems		25–30
Muffins, baking powder		20–25
Muffins, yeast		30

II. PASTRY, PUDDINGS, ETC.

Batter puddings		35–40
Bread puddings	¾–1	
Cheese straws		8–10
Custard pudding		30–45
Custard, cup		20–25
Indian pudding	2–3	
Patties		20–25
Pies		30–50
Plum pudding	2–3	
Rice pudding	1	
Rice pudding, creamy	2–3	
Soufflés		30–40
Tapioca pudding	1	
Tarts		15–20
Steaming.		
Brown bread	3	
Puddings	1–3	
Boiling.		
Plum pudding	6–8	

APPENDIX C

THE PRINCIPLES OF THE PREPARATION OF FOOD

Which have been Illustrated in the Preceding Chapters

Acid coagulates albumin.
Acid precipitates casein.
Acid softens connective tissue (collagen).
Acid softens cellulose.
Acid softens gelatine jellies.
Acid, water, and heat change starch to sugar.
Acid, water, and heat invert cane sugar.
Acid in strong solution is an antiseptic.

Heat coagulates albumin.
Heat softens gelatine.
Heat develops the flavor of the sapid extractives of food in proportion to the degree of temperature employed.
Heat converts starch to dextrine.
Heat caramelizes sugar.
Heat (dry) dehydrates foods, causing loss in weight.
Heat (moist) bursts starch cells.
Heat sterilizes foods by destroying germs.
Heat and water invert cane sugar.
Heat and water applied for a sufficient length of time convert starch into sugar.
Heat in excess will change the characteristic properties of gelatine.
Heat in excess will change the characteristic properties of pectin.
Heat destroys the active principle in pineapple juice.
Heat is readily conducted by water and steam.
Heat is not well conducted by dry air.
Heat is not well conducted by cooked food of an albuminous nature.
Heat is not well conducted by collaginous connective tissue.
Heat is not well conducted by dextrinized foods.

Heat volatilizes lemon juice.
Heat in excess causes a chemical change in citric acid, resulting in a disagreeable flavor.
Initial high temperature develops a more pronounced flavor than the same temperature gradually attained.

Salt toughens cellulose.
Salt in moderately strong solution lessens the solvent action of water.
Salt in weak solution dissolves globulin.
Salt yellows vegetable connective tissue.
Salt is an antiseptic.
Salt in solution raises the boiling point of water.

Water dissolves one-third its volume of salt.
Water (cold) dissolves one-third its volume of sugar.
Water, 212° F., dissolves three times its volume of sugar.
Water dissolves albumin.
Water (cold) is absorbed by gelatine.
Water (hot) dissolves previously hydrated gelatine.
Water dissolves the sapid extractives of foods.

Sugar toughens cellulose.
Sugar is a dehydrating agent.
Sugar in large quantity is an antiseptic.
Sugar in solution raises the boiling point of water.

Baking soda neutralizes acids.
Baking soda increases the solvent action of water.
Baking soda is decomposed by heat, with evolution of carbon dioxide.
Saltpeter, used in pickling or on corning meats, has an oxidizing action, and will preserve the red color.

Air can be beaten into albumin.
Air can be beaten into gelatine.
Air can be beaten into cream.
Air or gas can be held by gluten.

Spice is an antiseptic.
Retention of potassium salt makes potato less mealy when boiled or steamed.
A starchy thickening, added to milk, will prevent its being curdled by acid.

A starchy thickening will keep a custard from wheying.

Cooking in an open kettle will preserve the brightness of the color of vegetables.

The yolk of egg coagulates at a lower temperature than the white.

Hard-cooked yolk of egg is soluble in water.

Bromelin, the ferment in fresh pineapple juice, dissolves proteids.

Overheating of fats causes their decomposition, with the formation of a new substance which is an irritant poison.

When animal foods are immersed in salt solutions of a greater or less density than those of the fluids held in their own tissues, an exchange of these fluids takes place, with the consequent shrinkage or inflation of the food.

INDEX

INDEX